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Heterogeneity and anchoring in financial markets

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Abstract

Participants in Japanese stock markets tend to be heterogeneous; the types of firms to which survey respondents belong can affect the formation of expectations. Furthermore, the majority of market participants—even institutional investors who are financial market professionals—place significant weight on past forecast values, and the strength of the anchoring effects depends on the types of firms to which the respondents belong, as well as the stock market conditions.

Keywords: anchoring; heterogeneity; survey forecasts

JEL Classification: D03; G17

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I. Introduction

The motivation behind this article is to verify the efficient market hypothesis as found in traditional financial theories. We test the homogeneity of market participants and the rationality of the formation of expectations using a rich individual survey, the QUICK Survey System (QSS), provided by QUICK Corporation.

In analyzing forecasts made by market participants, we garner two pieces of information. First, participants in Japanese stock markets are not homogeneous, and the types of firms to which survey respondents belong can affect the formation of expectations. Traditional finance theories such as Capital Asset Pricing Theory (CAPM) and Modern Portfolio Theory (MPT) insist that the market is efficient, based as they are on rational market theory; meanwhile, previous literature claims that market participants are heterogeneous. For example, Lamont (2002) discusses how the more experience survey respondents gain in financial markets, the more radical their forecasts tend to become. Ito (1990) finds that in predicting exchange rates, individual effects vis-à-vis the formation of expectations tend to be more or less 'wishful'.

Second, the majority of market participants—even institutional investors—predict stock prices irrationally. In most cases, respondents' forecasts tend to bias toward their past forecasts. Interestingly, the anchoring effect—which was first noted by Tversky and Kahneman (1974)—has been found in the formation of expectations, among almost all firms: forecasts by domestic security firms have strong anchoring effects, whereas this is not the case with the formation of expectations among foreign security firms under 'normal' financial market conditions. These results can be brought about by the compensation structures and internal promotion systems of domestic and foreign security firms. The two findings reported in this article are inconsistent with the assumption inherent in traditional financial theories, that the formation of expectations among market participants is both homogeneous and rational.

A number of empirical studies exist regarding whether expectation formations are homogeneous and rational. Through empirical research on stock markets in the United States, Fama (1970) concludes that with but a few exceptions, the efficient markets model stands up well. Contrary to such a rational market theory, behavioural finance presents a valid theory, even if some investors are behaving irrationally.[1] Behavioural finance insists that the assumption of the efficient market hypothesis—namely, that stock prices fully reflect all available information—is too strong and far-removed from human capability.

Furthermore, Tversky and Kahneman (1974), with respect to decision-making under uncertain conditions, say that one cannot complete the decision-making process rationally, as traditional finance theories expect. They find that biases in judgment reveal some heuristics of thinking under uncertainty; they also propose calling 'anchoring'

[1] See Simon (1955, 1956).

a phenomenon wherein a judgment under uncertainty tends to yield irrational estimates, which are in turn biased toward the initial values.

This 'anchoring phenomenon' has been studied in various fields, as well as with respect to financial markets (e.g. forecasting macroeconomic variables, stock prices, bond yields and exchange rates). As for forecasting Japanese stock prices and bond yields, Fujiwara *et al.* (2011) show that forecasts made by market participants in Japanese financial markets tend to have anchoring effects. Although Fujiwara *et al.* (2011) find anchoring effects overall, the current study examines whether each professional forecaster places significant weight on past forecast values, by using the useful characteristics of panel data; it finds differences in anchoring effects among the different types of firms for which the survey respondents work.

The balance of this article is structured as follows. In Section 2, we explain the study's data and estimation strategy. Section 3 provides estimation results, and Section 4 concludes.

II. Data and Estimation Strategy

QSS data

Table 1. Surveys in the QSS

Item	Period	Time horizon of forecast
NIKKEI 225	April 1994–November 2011	1, 3, 6 months
TOPIX	June 2000–November 2011	1, 3, 6 months
JASDAQ	June 2000–November 2011	1, 3, 6 months

For the current study, we use the QSS, provided by QUICK Corporation. The use of QSS is rare but important in conducting broad and continuing surveys of market-participant sentiments. Since July 1996, it has asked market participants monthly about their views on equity prices, bond yields and the real economy. Respondents include market participants from securities firms, banks, investment trusts, insurance firms, pension funds and other private financial institutions. The QSS is an unbalanced panel that surveys about 150 people per month.

Among many survey items, we focus on surveys vis-à-vis stock-price expectations (see Table 1). For stock prices, we use NIKKEI 225, TOPIX and JASDAQ. For each, expectations for the next month, the next 3 months and the next 6 months for stock prices are gathered. QSS enables us to classify and analyse demographic data for each respondent surveyed, and QSS can also identify the firms to which those respondents belong.

Estimation strategy

The first analysis using QSS data determines whether or not the expected rates of return on equity prices are homogeneous. CAPM assumes homogeneous expectations; if the assumption is reasonable, the expected rates of return by market participants will be homogeneous.

The QSS data reveal the types of firms for which the respondents work: domestic security firms, foreign security firms, investment trust management firms, investment advisors, banks, trust banks, life insurance firms, general insurance firms and pension funds. In order to verify whether expectation formations in all firms are identical, we test whether the differences between individual forecasts and the mean of individual forecasts significantly vary across each type of firm. If the assumption of a homogeneous expectation is reasonable, the differences therein will not be significant. For example, forecasts predicted by those who belong to a foreign security firm should not be significantly different from the mean of forecasts made by individual forecasters. For testing homogeneity, we use the following model:

$$\frac{S^{i}_{t\to t+n}-\bar{S}_{t\to t+n}}{\bar{S}_{t\to t+n}} = \alpha_{t\to n} + \varepsilon_{t\to n} \tag{1}$$

where $S^{i}_{t\to t+n}$ denotes an individual i's survey forecast conducted in period t of the stock price in period t + n, and $\bar{S}_{t\to t+n}$ denotes the average of $S^{i}_{t\to t+n}$ for all i. The null hypothesis is $\alpha = 0$.

The second estimation tests whether anchoring effects differ by firm type, and it uses a model applied by Ichiue and Yuyama (2009). Fujiwara *et al.* (2011) clarify that forecasts made by market participants in Japan are not rational, and that anchoring effects do exist. This second estimation strategy focuses on how different anchoring effects exist in each firm.

For testing the anchoring effects of each firm, we consider a partial adjustment model of survey forecasts, as in Ichiue and Yuyama (2009):

$$S^{i}_{t\to t+n} = \rho_n S^{i}_{t-k\to t+n} + (1-\rho_n)E_t[K_{t+n}] \tag{2}$$

where ρ measures the degree of inertia in expectation. Naturally, if $\rho = 0$, the current survey forecasts $S_{t\to t+n}$ are equal to the market expectations, conditional on the information available at time t—namely, $E_t[K_{t+n}]$. Here, $0 \le \rho < 1$ implies that the current survey forecasts are influenced by previous surveys. By using the definition of forecast errors, equation (2) can be further rewritten as

$$K_{t+n} - S^{i}_{t\to t+n} = \beta\left(S^{i}_{t\to t+n} - S^{i}_{t-k\to t+n}\right) + \eta_{t\to t+n} \tag{3}$$

where

$$\beta = \frac{\rho}{1-\rho}$$

and

$$\eta_{t \to t+n} \equiv K_{t+n} - E_t[K_{t+n}]$$

Here, $\eta_{t \to t+n}$ denotes the forecast errors of the market expectations, which cannot be predicted from information known in period t under rational expectations. Thus, $\eta_{t \to t+n}$ should be considered white noise. As a result, we can test whether the degree of inertia ρ is nonzero or, in other words, a null hypothesis of β = 0, by regressing equation (3)[2].

III. Estimation Results

Homogeneity

Table 2 summarizes the test of whether differences between the forecasts of each firm type and the mean of forecasts are significant. 'Inv.' denotes investment trust management firms and investment advisors, 'Bank' denotes banks and trust banks and 'Ins.' denotes life insurance and general insurance firms.

Table 2. Test of homogeneity: α in equation (1)

Horizon	NIKKEI 225			TOPIX			JASDAQ		
	1M	3M	6M	1M	3M	6M	1M	3M	6M
Sec. (D)	0.53%**	0.99%**	1.50%**	0.45%**	0.83%**	1.22%**	0.34%**	0.53%**	0.78%**
Sec. (F)	-0.97%**	-2.13%**	-2.43%**	-0.86%**	-2.11%**	-2.58%**	-0.57%**	-1.38%**	-1.80%**
Inv.	0.13%**	0.19%*	0.06%	0.17%**	0.31%**	0.35%**	0.01%	0.12%	0.06%
Bank	-0.24%**	-0.54%**	-0.66%**	-0.38%**	-0.81%**	-1.08%**	-0.14%	-0.37%	-0.28%
Ins.	-0.42%**	-0.59%**	-1.11%**	-0.41%**	-0.65%**	-1.22%**	-0.37%**	-0.42%**	-0.64%**

Note: Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively. 'Sec. (D)' is domestic security firm, 'Sec. (F)' is foreign security firm, 'Inv.' is investment trust management firm and investment advisor, 'Bank' is bank and trust bank, and 'Ins.' is life insurance and general insurance firm.

According to the estimation results, heterogeneity exists in every classification. Table 2 shows that the forecast of each firm is significantly different from the mean of individual forecasts, in almost all cases: the null hypothesis, α = 0, is rejected in about 84% of cases. These estimation results are inconsistent with the aforementioned assumptions of CAPM and MPT. Furthermore, note that in the second row of Table 2, the estimated values of foreign security firms are significantly negative and the smallest among all types of firms.

[2] We employ pooled regression. Note that a constant term is not included in the regression, since the forecast errors of market expectations $\eta_{t \to t+n}$ should be unbiased, at least *ex ante*. Thus, if the estimated forecast errors are biased, we interpret biases to be sample artefacts.

These results indicate that the heterogeneity of market participants—especially that of foreign security firms—is remarkable.

As for the fact that heterogeneity exists among market participants, the following points can be discussed. The heterogeneity could arise from the respondents' experience with financial markets. Lamont (2002) says that the more experience survey respondents gain in financial markets, the more radical their forecasts tend to become. This means that respondents who have more experience with markets tend to make forecasts that are different from those of less-experienced respondents. This difference in terms of experience with financial markets may be attributable to heterogeneity among market participants.

Anchoring effects

As for anchoring effects, we estimate three patterns among the sample periods. Estimation results are shown in Tables 3–5. Table 3 covers the full sample period, and this sample period is further broken into two separate subperiods: before and after the turmoil of the 2008 financial crisis.

Table 3. Anchoring effects (ρ) during full sample period

Horizon	NIKKEI 225			TOPIX			JASDAQ		
	1M	3M	6M	1M	3M	6M	1M	3M	6M
Sec. (D)	0.04**	0.13**	0.05**	0.08**	0.14**	0.06**	0.01	0.04**	0.02**
Sec. (F)	0.00	0.00	0.03**	0.02	0.04	0.03**	-0.01	0.04	0.01
Inv.	0.07**	0.17**	0.06**	0.10**	0.17**	0.06**	0.07**	0.11**	0.04**
Bank	0.02	0.12**	0.04**	0.06**	0.15**	0.05**	0.04**	0.11**	0.04**
Ins.	0.01	0.06**	0.01	0.06**	0.11**	0.03**	0.00	0.04*	0.01

Note: Nikkei 225 covers April 1994 to November 2010, and TOPIX and JASDAQ cover June 2000 to November 2011. Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively. 'Sec. (D)' is domestic security firm, 'Sec. (F)' is foreign security firm, 'Inv.' is investment trust management firm and investment advisor, 'Bank' is bank and trust bank, and 'Ins.' is life insurance and general insurance firm.

The estimation results suggest the following three points. First, Table 3 indicates that anchoring effects exist in almost all types of firms. In fact, 32 cases reject the null hypothesis, H_0: $\rho = 0$. This result is supported by the results in Table 4, which also show that anchoring effects existed prior to the financial turmoil.

Anchoring effects may occur because those who are engaged in forecasting stock prices every month are conscious of consistency between past and present forecasts. Consider a person who is responsible for informing customers of stock price forecasts. Such a person as an investment advisor may anchor his or her present forecast to his or her past forecast, because if he or she were to suddenly change perspective drastically vis-à-vis stock

markets, he or she would need to explain what had fundamentally changed and why he or she had been wrong. As a result, anchoring effects vary in most types of firms.

Table 4. Anchoring effects (ρ) in sample subperiod 1

Horizon	NIKKEI 225			TOPIX			JASDAQ		
	1M	3M	6M	1M	3M	6M	1M	3M	6M
Sec. (D)	0.03**	0.11**	0.05**	0.06**	0.11**	0.05**	0.01	0.04**	0.02**
Sec. (F)	-0.01	-0.02	0.02	-0.02	-0.02	0.00	-0.02	0.01	0.00
Inv.	0.07**	0.17**	0.06**	0.09**	0.16**	0.06**	0.06**	0.12**	0.04**
Bank	0.02	0.11**	0.04**	0.04**	0.13**	0.05**	0.04*	0.12**	0.06**
Ins.	-0.01	0.03*	0.00	0.03*	0.07**	0.00	-0.01	0.03	0.01

Note: Nikkei 225 covers April 1994 to June 2008, and TOPIX and JASDAQ cover June 2000 to June 2008. Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively. 'Sec. (D)' is domestic security firm, 'Sec. (F)' is foreign security firm, 'Inv.' is investment trust management firm and investment advisor, 'Bank' is bank and trust bank, and 'Ins.' is life insurance and general insurance firm.

Table 5. Anchoring effects (ρ) during sample subperiod 2

Horizon	NIKKEI 225			TOPIX			JASDAQ		
	1M	3M	6M	1M	3M	6M	1M	3M	6M
Sec. (D)	0.11**	0.19**	0.07**	0.13**	0.21**	0.09**	0.06**	0.02	0.02**
Sec. (F)	0.16**	0.27*	0.12**	0.21**	0.31**	0.14**	0.15**	0.27**	0.09**
Inv.	0.10**	0.18**	0.06**	0.13**	0.20**	0.07**	0.08**	0.05	0.02**
Bank	0.07**	0.16**	0.04**	0.10**	0.18**	0.05**	0.00	0.04	-0.01
Ins.	0.12**	0.17**	0.06**	0.16**	0.22**	0.07**	0.10**	0.09*	0.03*

Note: Nikkei 225, TOPIX, and JASDAQ cover July 2008 to November 2010. Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively. 'Sec. (D)' is domestic security firm, 'Sec. (F)' is foreign security firm, 'Inv.' is investment trust management firm and investment advisor, 'Bank' is bank and trust bank, and 'Ins.' is life insurance and general insurance firm.

The second finding is that foreign security firms (Sec. (F)) have weaker anchoring effects than do other types of firms. The second column in Table 3 indicates that H_0 is rejected in only two of nine cases over the full sample period. Furthermore, when we estimate our model over the subperiod prior to the financial turmoil, we find no anchoring effects among foreign security firms. Looking at the second row of Table 4, the null hypothesis, $\rho = 0$, is not rejected in all stock indices and all horizons. These results are very interesting, because it is the only type of firm in which anchoring effects are *not* found. Other firms—such as domestic securities and investment advisory, or investment trust companies—do have anchoring effects. Based on this exceptional result regarding foreign security firms, the heterogeneity of foreign securities is remarkable. Remember that, in the first analysis for heterogeneity, the heterogeneity of foreign securities is also noteworthy, because their forecasts are more

cautious than the overall average in all indices. One possible reason for the heterogeneity among foreign securities is that it may have derived from their respective compensation structures and internal promotion systems, which differ from those of Japanese companies.

Finally, we find that there are stronger anchoring effects in the post-financial crisis subperiod, for all types of firms. Table 5 shows that the null hypothesis is rejected in 40 out of 45 cases (89%). Moreover, the values of ρ are higher than those of Table 3, which means that forecasters placed more weight on their past forecasts *after* the turmoil than they did *before* the turmoil. It is interesting that once the market collapses, all the respondents had significantly adhered to past forecasts.

IV. Conclusion

In this article, through a definitive analysis of panel data pertaining to Japanese stock market forecasting, the following two points are clarified. First, market participants are heterogeneous. Second, the majority of market participants—even institutional investors—place significant weight on past forecast values and the strength of the anchoring effects depends on the types of firms to which the respondents belong, as well as the stock market conditions. The fact that anchoring effects vary among the different types of firms suggests that expectation formations are also affected by the types of firms for which survey respondents work.

The findings obtained in this study are inconsistent with the assumption of traditional finance theories that forecasts are homogeneous and rational. If the assumption is not reasonable, it raises the following implications: if market participants are heterogeneous, how is the equilibrium of a stock price affected? Is there any possibility that anchoring effects contribute to a bullish market and can eventually cause a stock market bubble? These are the foci of our future work.

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