Bank of Japan Working Paper Series

Private Information and Analyst Coverage: Evidence from Firm Survey Data

Yoshiyuki Nakazono*
nakazono@yokohama-cu.ac.jp

Maiko Koga**
maiko.koga@boj.or.jp

Tomohiro Sugo**
tomohiro.sugou@boj.or.jp

No.18-E-17
October 2018

Bank of Japan
2-1-1 Nihonbashi-Hongokucho, Chuo-ku, Tokyo 103-0021, Japan

* Yokohama City University
** Research and Statistics Department

Private Information and Analyst Coverage: Evidence from Firm Survey Data*

Yoshiyuki Nakazono† Maiko Koga‡ Tomohiro Sugo§

Abstract

Using a unique panel of survey data on Japanese firms, we provide evidence that firms hold private information revealed in the survey that has predictive power for stock returns. Specifically, we find that the information contained in firms' industry demand forecasts can predict the stock returns of the sector and individual firms up to the next five years. We also uncover the origin of the information advantage of firms, by examining its relation to analyst coverage. To examine the source of the information asymmetry this result implies, we focus on the extent to which firms are covered by securities analysts and find that such information asymmetry arises only in the case of firms not sufficiently covered by analysts.

JEL Classification: D84; G23

Keywords: analyst coverage; efficient market hypothesis; return predictability; information advantage; private information; survey data

*We thank the Economic and Social Research Institute of the Cabinet Office of Japan for providing us with microdata from the "Annual Survey of Corporate Behavior." We also thank Kosuke Aoki, Hibiki Ichiue, Sohei Kaihatsu, Toshitaka Sekine, Yosuke Uno, Toshinao Yoshiba, and other BOJ staff members for their comments and suggestions. The views expressed in this paper do not necessarily reflect those of the Bank of Japan. Permission for using microdata is given under the agreement between ESRI and the Bank of Japan. The work of this paper has been conducted while Nakazono was working as an adviser at the Research and Statistics Department of the Bank of Japan. Nakazono acknowledges financial support from JSPS KAKENHI Grant Number 15K17024 and the Yokohama Academic Foundation.

†Yokohama City University, nakazono@yokohama-cu.ac.jp

‡Bank of Japan, maiko.koga@boj.or.jp

§Bank of Japan, tomohiro.sugou@boj.or.jp

1 Introduction

A growing number of studies using firm survey data show that expectations play an important role in firms' behavior and in business cycles (e.g., Bachmann et al. (2013) and Gorodnichenko et al. (2015)). However, the value of information contained in firm surveys has not been well examined in the literature. Instead, macroeconomic studies tend to regard stock prices as a well-performing measure of the value of firms and their investment. This study argues that firm surveys are worth investigating, since they contain information that is not necessarily reflected in firms' stock prices.

Using a unique panel of survey data of Japanese firms from 1989 to 2015, we provide evidence that firms' industry demand forecasts reported in the survey have predictive power for stock returns. Specifically, we regress survey responses on aggregate and sector-level variables and assume that the residual provides "private information" revealed by firms regarding their own view on the industry in which they operate. We find that this information predicts the stock returns of each sector and of individual firms up to the next five years. We also find that such information predicts firms' plans for capital investment and employment over the next three years, even after controlling for Tobin's Q and other possible determinants. Under the efficient market hypothesis, surveys such as the one used in this study should not provide any information useful for predicting stock returns or firms' business prospects, since firms in theory disclose all relevant information in the market as needed. However, what we find is that our information measure makes it possible to predict such stock returns as well as individual firms' plans for investment and employment. These results represent new evidence that firms have an information advantage over the market in that they hold information that is not revealed to the market but is revealed in survey data. We refer to this information as "private information."[1]

Next, based on this finding, we examine the reason for this information advantage held by

[1] Private information of an agent originally means information that other parties do not hold, and our terminology in this paper refers to private information in the broader sense as information that outsiders cannot easily access. This includes information regarding the future profitability of the business, such as the detailed outlook for business plans and the expected demand in each sector.

firms. Specifically, we show that the predictive power of survey information is closely linked to the extent to which firms are covered by securities analysts. Securities analysts typically meet firm executive officers on a regular basis to discuss the firm's earnings forecasts and business plans for the future. The analysts then write notes about revisions to earnings forecasts and convey information about firms' earnings forecasts to their clients. This process disseminates information in financial markets that otherwise would be private to the firm. However, because not all firms listed on the stock market in Japan are covered by securities analysts, the extent to which information on individual firms is available differs. We show that the extent to which survey information provides predictive power depends on the extent to which firms are covered by analysts. These findings suggest that the reason for the information asymmetry between firms and the market is that certain firms are insufficiently covered by analysts and that the survey responses reveal information held by firms that is not incorporated in stock prices.

Our paper is related to three strands of the literature. First, our paper is related to studies exploring asymmetric information among economic agents. A large body of literature reports that there is asymmetric information among economic agents and describes sources of the information advantage of specific agents. For example, Coval and Moskowitz (2001), Malloy (2005), Bae et al. (2008), and Baik et al. (2010) document that a shorter distance between analysts and firms is associated with better forecast accuracy on firms' earnings by analysts. Using forecasts on foreign exchange rates, Kaufmann et al. (2005) show that local managers have valuable information about the country where they reside. Meanwhile, Hutton et al. (2012) find that managers of a firm have an information advantage with regard to their firm's earnings forecasts, while analysts have an information advantage with regard to macroeconomic forecasts. Our findings contribute to the existing literature by presenting another source of information advantage.

Second, our approach is based on previous studies indicating that analysts contribute to information production in financial markets (e.g., Lys and Sohn (1990), Womack (1996), and Brav and Lehavy (2003)). Past studies also examine information diffusion by analysts. For example, Lee and So (2017) highlight the relationship between analyst coverage and the predictability of firms' future earnings. Hong et al. (2000) find that the speed of news diffusion is positively associated with the number of analysts covering a particular firm. Andrade et al. (2013) show that bubbles in stock prices are smaller when there is greater analyst coverage. In contrast to the above studies that only focus on the value of diffused information, we directly identify the remaining information at the firm which is neither produced by analysts nor diffused in the market. Our unique firm survey data allows us to compare such private information with information shared in the stock market. We find robust evidence that analysts play a crucial role in disseminating information in the market.

Third, our study is related to the literature analyzing firm surveys and their macroeconomic implications. Gennaioli et al. (2016) argue that corporate managers' actual expectations provide valuable information in explaining fixed investment, because such information is not captured by market-based measures such as Tobin's Q. The macroeconomic implications of firm responses in surveys have been also explored in the context of firms' low forecasting ability. Recent studies argue that firms' biased expectations lead to over- or underinvestment and impair social welfare (e.g., Bachmann and Elstner (2015), Koga and Kato (2017), Massenot and Pettinicchi (2018)). Tanaka et al. (2018) show that firms that make accurate forecasts tend to have higher profits and productivity. In contrast to these studies exploring the accuracy of firms' forecasts, our paper sheds light on whether firms' forecasts have predictive power for stock prices.

The rest of this paper is organized as follows. Section 2 describes the data. Section 3 presents the estimation strategy and provides the results regarding firms' information advantage. Section 4 examines where this advantage comes from. Section 5 concludes.

2 Data

We use the data of the "Annual Survey of Corporate Behavior" conducted by the Economic and Social Research Institute, Cabinet Office of Japan. The survey has been implemented for more than 25 years and covers approximately 1,000 firms each year, all of which are listed on the stock market in Japan. It is conducted annually between mid-December and mid-January and around 40% of firms respond to the survey among the all listed companies. The survey asks responding firms about their view regarding their business outlook and their demand forecasts, so that the data reflects the views of firms' managers. Specifically, respondents are asked to provide their forecasts of the nominal and real growth rate of GDP and industry demand over the next one, three, and five years, and the annual average percentage change in capital investment and the number of employees over the next three years.

The items we use are forecasts of Japan's real GDP growth rate in the following fiscal year starting in April. With regard to the business outlook for Japan and firms' demand forecast for their industry, the FY 2016 survey, for example, asked respondents the following:

> Please enter a **figure up to one decimal place** in each of the boxes below as your rough forecast of Japan's nominal and real economic growth rates and the nominal and real growth rates of demand in your industry for FY 2017, the next three years (average of FY 2017–2019) and the next five years (average of FY 2017–2021).

The question requires respondents to provide 12 responses in numerical values, namely the expected nominal and real growth rates of GDP and industry demand over the next one, three, and five years.

We also use the growth rate of capital expenditure and the change in the number of employees. As for capital investment, respondents are asked to answer the following question:

> How does your company view the annual average percentage changes in capital investment (construction work basis) for the past three years (average of FY2014–2016) and the next three years (average of FY2017–2019)? Please choose and circle the one number that applies as the past percentage change and the future forecast.

As for the number of employees, respondents are asked to answer the following question:

> With regard to the situation of the number of employees at your company in the past three years (average of FY2014–2016) and your forecast for the next three years (average of FY2017–2019), please choose and circle the one number that applies for "overall" and "fulltime employees."

For both questions, i.e., about capital investment and the number of employees, respondents are asked to select from various options such as "between 5% and 10%", "between 0% and 5%", " 0%", and "between -5% and 0%." To transform these range forecasts into data for analysis, we use the mid-point of each range.[2]

Table 1 provides descriptive statistics of the forecasts for the growth rates of real GDP and industry demand, while Figures 1 and 2 show their means over time. The summary statistics and figures allow three observations. First, as seen in the figures, forecasts of both real GDP growth and industry demand growth trended down in the 1990s and then remained more or less stable. Second, forecasts for longer horizons are higher and less volatile than those for shorter horizons. As shown in Table 1, the means of the three- and five-year-ahead forecasts are larger by about 0.3-0.5 percentage points with lower standard deviations than the one-year-ahead forecasts. Third, the cross-sectional dispersion of forecasts for industry demand is larger than that of GDP forecasts. Table 1 shows that the standard deviations of industry growth forecasts are larger than those of GDP growth forecasts for all horizons. The large disagreement about the outlook for each industry implies that individual firms' view about their specific sector may contain valuable information which only respondents possess.

In our empirical analysis, we match the firm survey data with firm-level financial data. Specifically, we use financial data obtained from the "Financial Data of Listed Firms" released by the Development Bank of Japan and stock prices obtained from Bloomberg.

[2]The highest and lowest options are open ended. Following conventional practice (see, e.g., Boero et al. (2015) and Gorodnichenko et al. (2015)), in these cases we add (minus) 5 percentage points to the cut-off value, so that for example for the option "25% or more" we use a value of 30%.

3 Estimation strategy and results

3.1 Does private information predict sector returns?

First, we identify the proxy for private information by regressing firms' growth forecast for the sector in which they operate on three sets of variables: macroeconomic variables, sector-specific variables, and firm-specific variables. Specifically, we estimate the following equation:[3]

$$f_{i,t \to t+k}^{Sector_j} = \alpha_1 f_{i,t \to t+k}^{\text{Real GDP}} + \alpha_2 DI_{j,t}^{\text{Tankan}} + y_t + d_i + \mu_{i,t}^k, \tag{1}$$

where $f_{i,t \to t+k}^{Sector_j}$ denotes firm i's forecast of its own sector j's growth rate over k years ahead at time t.[4] To obtain private information about sector j, which is orthogonal to both macroeconomic factors and factors specific to sector j, we use $f_{i,t \to t+k}^{RealGDP}$ and $DI_{j,t}^{\text{Tankan}}$, where $f_{i,t \to t+k}^{RealGDP}$ denotes firm i's forecast of the GDP growth rate over k years ahead at time t and $DI_{j,t}^{\text{Tankan}}$ denotes the level of current business confidence in sector j taken from the $Tankan$ Survey.[5] y_t and d_i represent time dummies and firm fixed effects, respectively. Adding time dummies to Equation (1) allows us to control for the possible correlation of variables that macro factors may produce. Using the residuals ($\hat{\mu}_{i,t}^k$) and the fixed effect ($\hat{d}_i$) obtained in Equation (1), we define $\hat{\varepsilon}_{i,t}^k \equiv \hat{\mu}_{i,t}^k + \hat{d}_i$.[6] $\hat{\varepsilon}_{i,t}^k$ is our measure of firms' private information about their own performance as well as that of their sector.[7]

$$\Delta r_{t+k}^{Sector_j} = \beta_1 \hat{\varepsilon}_{i,t}^k + \beta_2 f_{i,t \to t+k}^{\text{Real GDP}} + \beta_3 DI_{j,t}^{\text{Tankan}} + y_t + c_j + e_{i,t}^k, \tag{2}$$

where $\Delta r_{t+k}^{Sector_j}$ is the (abnormal) stock return in sector j (represented by the sectoral stock index) relative to the return in the stock market overall represented by the TOPIX (Tokyo

[3]Our estimation strategy in Equation (1) is similar to that employed by Bonsall et al. (2013), who decompose analysts' earnings forecasts into macroeconomic and firm-specific factors.

[4]In order to mitigate the effects of outliers, observations lying outside three standard errors are omitted.

[5]"Short-term Economic Survey of Enterprises" released by the Bank of Japan.

[6]Figure 3 shows developments over time in the standard deviations of $\hat{\varepsilon}_{i,t}^k$.

[7]As an alternative, we also estimate the equation using $\hat{\mu}_{i,t}^k$ instead of $\varepsilon_{i,t}^k$ to represent firms' private information and obtain similar results.

Stock Price Index) from t to $t+k$.[8] c_j represents fixed effects and y_t is a time dummy. If β_1 in Equation (2) is positive and significant, this suggests that the identified private information has predictive power regarding the future returns in sector j.

Table 2 shows the predictive power of one-year-ahead forecasts, i.e., when $k = 1$. The table shows that β_1 is positive and significant in two out of the four cases. This suggests that our measure of private information represented by $\hat{\varepsilon}^k_{i,t}$ has predictive power with regard to abnormal returns in the case of these two sectors. Tables 3 and 4 report the estimation results when $k = 3$ and $k = 5$, respectively. The tables show that the coefficients on $\hat{\varepsilon}^3_{i,t}$ and $\hat{\varepsilon}^5_{i,t}$ are positive and significant in all cases. This indicates that the private information identified from the survey can forecast the returns of each sectoral index even three and five years ahead.

We also regress the returns in sector j on $\hat{\varepsilon}^1_{i,t}$ to examine if the private information identified using one-year-ahead forecasts has predictive power even for three- and five-year-ahead stock returns in sector j. The coefficients on $\hat{\varepsilon}^1$ in Tables 3 and 4 are all significantly positive, and this result supports our hypothesis. [9]

3.2 Does private information predict firm i's stock returns?

Next, to explore the characteristics of firms' private information, we examine whether $\hat{\varepsilon}^k_{i,t}$ from Equation (1) helps to predict individual stock returns over one, three, and five years ahead. Specifically, we estimate the following equation:

$$\Delta r^{Stock_i}_{t+k} = \beta_1 \hat{\varepsilon}^k_{i,t} + \beta_2 f^{\text{Real GDP}}_{i,t \to t+k} + \beta_3 DI^{\text{Tankan}}_{j,t} + \gamma_1 \ln(Size_{i,t}) + \gamma_2 \ln(PBR_{i,t}) + y_t + c_i + e^k_{i,t}, \tag{3}$$

where $\Delta r^{Stock_i}_{t+k}$ is the abnormal return of each firm i over k years ahead relative to the return of the TOPIX. $\ln(Size_{i,t})$ and $\ln(PBR_{i,t})$ are the logarithm of firm i's market capitalization

[8] For example, $\Delta r^{Sector_j}_{t+1}$ denotes the abnormal annual return from the end of year t to the end of year $t+1$ when $k = 1$.

[9] In addition, we find that the $\bar{R}^2$ of Equation (2) and the subsequent equations is larger than that of the model without $\hat{\varepsilon}^k_{i,t}$. This also supports the finding that $\hat{\varepsilon}^k_{i,t}$ contains valuable information in predicting stock returns (not reported here).

and price-book value ratio (PBR) at time t, respectively.[10] Individual stock returns cannot be predicted *ex ante*. While γ_1 and γ_2 may be significantly negative due to the small firm effect (i.e., the fact that small firms have the potential to grow faster than larger ones) and the value effect (i.e., the fact that value firms tend to outperform the market), β_1 in Equation (3) should be zero. $DI_{j,t}^{\text{Tankan}}$ is included to control for factors specific to sector j. If β_1 in Equation (3) is significantly positive, this suggests that the identified private information predicts the future return of individual stocks.

Tables 5, 6, and 7 show the estimation results for $k = 1$, 3, and 5, respectively. As can be seen in Table 5, β_1 is significantly positive in all specifications. This implies that $\hat{\varepsilon}_{i,t}^{k}$ predicts firms' stock returns one year ahead. The coefficients on the variables representing market capitalization and the PBR (γ_1 and γ_2) are significantly negative in all cases. These results are consistent with the small firm effect and value effect hypotheses.[11]

We also obtain significantly negative coefficients for these two variables when the forecast horizon changes from one year to three or five years (6 and 7).

Next, Table 6 reports the estimation results when we focus on stock market returns over three years ahead. As can be seen, both $\varepsilon_{i,t}^{1}$ and $\varepsilon_{i,t}^{3}$ are significant, while $\varepsilon_{i,t}^{1}$ has less predictive power for returns three years ahead. Table 7 shows the results for stock returns over five year ahead. In this case, only $\varepsilon_{i,t}^{1}$ is (weakly) significant. These findings suggest that $\varepsilon_{i,t}^{k}$ has predictive power only over shorter horizons. While the predictive power of the identified private information for sectoral returns is relatively limited compared to that for firm-level stock returns, the above findings broadly support the results in the previous subsection. This implies that the variable contains valuable information and that firms have an information advantage in forecasting the returns on their own stock price even three and five years ahead.

[10] We include these variables to take firms' size and book-to-market value into account, which Fama and French (1995) identify as potential other factors affecting stock returns. Market capitalization and price-to-book value ratios are calculated based on the "Financial Data of Listed Firms" issued by the Development Bank of Japan. In order to mitigate the effects of outliers, firms with a negative PBR were dropped from the sample.

[11] The negative association between the one-year-ahead stock return of individual firms and $DI_{j,t}^{\text{Tankan}}$ implies that stock prices of firms enjoying favorable business conditions are likely to fall in the short-run. One possible interpretation of this is that stock price changes reflect a mechanism similar to the value effect: firms with a high stock market valuation are more likely to experience a decrease in their stock price.

3.3 Does private information predict firms' capital investment and employment?

In this subsection, we examine the association between the private information represented by $\hat{\varepsilon}^k_{i,t}$ in Equation (1) and firms' plans for the future. Specifically, the items we focus on are firms' expectations of changes in capital expenditure and the number of employees over the next three years. Using the residuals obtained from Equation (1), we examine whether $\hat{\varepsilon}^3_{i,t}$ predicts actual capital investment and the number of employees by estimating the following equation:

$$M^i_{t\to t+3} = \beta_1 \hat{\varepsilon}^3_{i,t} + \beta_2 f^{\text{Real GDP}}_{i,t\to t+3} + \beta_3 DI^{\text{Tankan}}_{j,t} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + y_t + c_i + e_{i,t}, \tag{4}$$

where $M^i_{t\to t+3}$ is the forecast of the average percentage change in capital expenditure ($Inv^i_{t\to t+3}$) or the number of employees ($Emp^i_{t\to t+3}$) of firm i over the next three years. $\boldsymbol{X}_{i,t}$ is a vector of control variables, and $\boldsymbol{\gamma}$ is a vector of the associated coefficients. In the estimation on capital expenditure, the variables included in $\boldsymbol{X}_{i,t}$ are Tobin's Q, the ratio of cash flow to assets, the ratio of debt to assets, and the logarithm of the market capitalization of firm i.[12] In the estimation on firms' number of employees, variables included in $\boldsymbol{X}_{i,t}$ are the market capitalization of firm i, the wage growth rate, and the degree of labor market slack. [13]

Tables 8 and 9 show the results. Starting with the results for capital expenditure, Table 8 shows that the coefficients on $\hat{\varepsilon}^3_{i,t}$ and on Tobin's Q are all positive and significant. These results suggest that $\hat{\varepsilon}^3_{i,t}$ predicts firms' future investment over the next three years even when Tobin's Q is included as a control variable. Turning to the results for employment in Table 9 shows that the coefficients on $\hat{\varepsilon}^3_{i,t}$ again are positive and significant in all cases. These results suggest that the identified private information reflects individual firms' future business

[12] The necessary data are taken from the "Financial Data of Listed Firms" released by the Development Bank of Japan. We use average Tobin's Q, defined as the (Market value of firm equity + Long-term debt + Debt in current liabilities) / Total assets.

[13] For the degree of labor market slack, we use data on the employment conditions in each industry. The data are taken from the "Short-term Economic Survey of Enterprises (TANKAN)" by the Bank of Japan.

prospects, which in turn explains the predictive power with regard to stock returns found in the previous subsections.

4 Where does information advantage come from?

The previous section showed that $\hat{\varepsilon}^k_{i,t}$ predicts sectoral and individual stock returns. This suggests that it reflects information that is private to managers of the firm and not shared by market participants, so that managers have an information advantage. This section examines the possible reasons for this information advantage. In particular, what we focus on is the role of analysts in conveying firm-specific information to the market. Securities analysts regularly meet with firm executive officers to discuss the firm's earnings forecasts and business plans for the future. The analysts then write notes about revisions to earnings forecasts and the new price target for the stock of that particular firm and provide their clients with their updates. Through this process, information that would otherwise remain private to the firm is disseminated to the market.

However, firms are not all covered equally by securities analysts, so that the extent to which information is disseminated in the market and consequently incorporated in stock prices differs across firms. In fact, more than half of all listed firms in Japan are not covered by any securities analysts. Table 10 shows summary statistics for the number of analysts covering a particular firm.[14] The table shows that the median is zero, implying that more than half of all firms were not covered by a single analyst. The fact that a substantial number of firms were not covered by analysts means that information about these firms potentially is reflected more slowly in the stock price than is the case of firms that are widely covered. This means that a possible reason why $\hat{\varepsilon}^k_{i,t}$ predicts stock prices is that managers' survey responses contain information not disseminated in the market in the case of firms that are not (widely) covered by analysts.

Therefore, in order to examine whether only information from firms with no or little ana-

[14]The data covers the period from 2006 to 2015.

lyst coverage predicts stock returns, we first identify firms with a low analyst coverage. Lee and So (2017) argue that, generally speaking, firms' coverage by analysts is determined by the stock market turnover of a firm's shares and the momentum of the stock price. Employing their specification, we conduct the following regression:

$$\ln(AC_{i,t}) = \alpha_1 \ln(Size_{i,t}) + \alpha_2 TO_{i,t} + \alpha_3 Momen_{i,t} + c_i + \nu_{i,t}, \tag{5}$$

where $AC_{i,t}$, $TO_{i,t}$, and $Momen_{i,t}$ respectively denote the total number of analysts covering firm i at the end of year t, the share turnover calculated as the trading volume scaled by the number of shares outstanding, and firm i's returns from $t-1$ to t, which represent the momentum of the stock price.[15] In the equation, we define the residual $\nu_{i,t}$ as the abnormal coverage of firm i at time t. When $\nu_{i,t} < 0$, we regard firm i as having low coverage, and we expect that for such firms $\varepsilon^k_{i,t}$ predicts their stock returns. On the other hand, when $\nu_{i,t} > 0$, we regard the firm as excessively covered, so that we expect that $\varepsilon^k_{i,t}$ has no predictive power, since all relevant information has been widely disseminated.

Using the identified $\hat{\nu}_{i,t}$ from Eqution (5), we estimate the following equation with the interaction term of $\hat{\varepsilon}^k_{i,t}$ and a dummy variable representing lower analyst coverage:

$$\Delta r^{Stock_i}_{t+k} = \beta_1 \hat{\varepsilon}^k_{i,t} + \beta_2 D^{LCov} + \beta_3 \hat{\varepsilon}^k_{i,t} \times D^{LCov} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t} + y_t + c_i + e^k_{i,t}, \tag{6}$$

where $\hat{\varepsilon}_{i,t}$ and D^{LCov} denote the private information obtained from Equation (1) and a dummy variable which takes one when $\hat{\nu}_{i,t}$ is below the lower quartile (*i.e.* $Q_{25\%}$), and zero otherwise. When $D^{LCov} = 1$, the firm is considered to have "excessively" small coverage in the sense that Equation (5) suggests that more analysts should cover firm i. $\boldsymbol{X}_{i,t}$ is a vector of control variables, while $\boldsymbol{\gamma}$ is a vector of the corresponding coefficients. The coefficient β_3 should be zero if the hypothesis that $\hat{\varepsilon}^k_{i,t}$ predicts stock price returns only in the case of firms with low coverage does not hold. However, if the hypothesis holds, β_3 should be positive and significant.

[15]The data to calculate these variables is obtained from Bloomberg.

Tables 11 and 12 report the estimation results of Equation (6) when the forecast horizon k is one and three years, respectively. Table 11 shows that the coefficient on the interaction term is positive and significant in all cases. The result suggests that the hypothesis that only in the case of firms with a low coverage by analysts $\hat{\varepsilon}^k_{i,t}$ predicts firms' stock returns holds. Figure 4 provides a visual representation of the positive relationship between $\hat{\varepsilon}^k_{i,t}$ stock returns when $\hat{\nu}_{i,t} < Q_{25\%}$. Furthermore, the coefficient estimates for the interaction term here are larger than the coefficient estimates for $\hat{\varepsilon}^1$ in 5: while the former are around 2.3, the latter are only around 0.6. Similar results are obtained in Table 12, which reports the results for $k = 3$. Again, the coefficient on the interaction term is positive and significant in all cases. Therefore, our hypothesis is supported: the fact that survey responses can be used to predict stock returns is "caused" by firms that receive little coverage by analysts, which implies that in the case of such firms managers hold information that is not sufficiently disseminated to the market.

5 Conclusion

This paper examined whether individual firms possess an information advantage that allows forecasting their stock returns. Using a unique panel of survey data on Japanese firms from 1989 to 2015, we provide evidence that information revealed by firms in the survey has predictive power for the stock returns of the sector a firm operates in as well as the returns of firms' own stocks up to the next five years. The information also predicts the average annual change in capital investment and the number of employees over the next three years, suggesting that the private information reflects individual firms' business prospects. We also identify why this is the case. Specifically, we showed that the above association between the private information and stock prices is observed only for firms with a low coverage by securities analysts. This suggests that firms which are not covered much by analysts hold information that has not been disseminated to the market.

Our findings imply that firms' subjective beliefs revealed in the survey can unveil information not reflected in stock prices, and that stock prices are not a sufficient source of information for measuring the value of firms and their future business prospects. The firm-level expectations revealed in surveys provide information not only for assessing individual firms, but also to the wider market by using aggregate metrics such as the means of firms' expectations. Investigating the expectations expressed in surveys can mitigate the information asymmetry between firms and market participants.

References

Andrade, Sandro C., Jiangze Bian, and Timothy R. Burch (2013) "Analyst coverage, information, and bubbles," *The Journal of Financial and Quantitative Analysis* 48, pp.1573–1605.

Bachmann, Rüdiger, Steffen Elstner, and Eric R. Sims (2013) "Uncertainty and economic activity: Evidence from business survey data," *American Economic Journal: Macroeconomics* 5, pp.217–249.

Bachmann, Rüdiger and Steffen Elstner (2015) "Firm optimism and pessimism," *European Economic Review* 79, pp.297–325.

Bae, Kee-Hong, René M. Stulz, and Hongping Tan (2008) "Do local analysts know more? A cross-country study of the performance of local analysts and foreign analysts," *Journal of Financial Economics* 88, pp.581–606.

Baik, Bok, Jun-Koo Kang, and Jin-Mo Kim (2010) "Local institutional investors, information asymmetries, and equity returns," *Journal of Financial Economics* 97, pp.81–106.

Boero, Gianna, Jeremy Smith, and Kenneth F. Wallis (2015) "The measurement and characteristics of professional forecasters' uncertainty," *Journal of Applied Econometrics* 30, pp.1029–1046.

Bonsall, Samuel B., Zahn Bozanic, and Paul E. Fischer (2013) "What do management earnings forecasts convey about the macroeconomy," *Journal of Accounting Research* 51, pp.225–266.

Brav, Alon, and Reuven Lehavy (2003) " An empirical analysis of analysts' target prices: Short-term informativeness and long-term dynamics," *The Journal of Finance* 58, pp.1933–1967.

Coval, Joshua D., and Tobias J. Moskowitz (2001) "The geography of investment: Informed trading and asset prices," *Journal of Political Economy* 109, pp.811–841.

Coibion, Olivier, Gorodnichenko, Yuriy and Kumar, Saten (2015) "How do firms form their expectations? New survey evidence," NBER Working Papers No.21092.

Fama, Eugene F., and Kenneth R. French (1995) "Size and book-to-market factors in earnings and returns," *The Journal of Finance* 50, pp.131–155.

Gennaioli, Nicola, Yueran Ma, and Andrei Shleifer (2016) "Expectations and investment," *NBER Macroeconomics Annual* 30, pp.379–431.

Hong, Harrison, Terence Lim, and Jeremy C. Stein (2000) "Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies," *The Journal of Finance* 55, pp.265–295.

Hutton, Amy P., Lian Fen Lee, and Susan Z. Shu (2012) "Do managers always know better? The relative accuracy of management and analyst forecasts," *Journal of Accounting Research* 50, pp.1217–1244.

Kaufmann, Daniel, Gil Mehrez, and Sergio L. Schmukler (2005) "Predicting currency fluctuations and crises: Do resident firms have an informational advantage?," *Journal of International Money and Finance* 24, pp.1012–1029.

Koga, Maiko, and Haruko Kato (2017) "Behavioral biases in firms' growth expectations," Bank of Japan Working Paper Series, No. 17-E-9.

Lee, Charles M.C., and Eric C. So (2017) "Uncovering expected returns: Information in analyst coverage proxies," *Journal of Financial Economics* 124, pp.331–348.

Lys, Thomas, and Sungkyu Sohn (1990) "The association between revisions of financial analysts' earnings forecasts and security-price changes," *Journal of Accounting and Economics* 13, pp.341–363.

Malloy, Christopher (2005) "The geography of equity analysis," *The Journal of Finance* 60, pp.719–755.

Massenot, Baptiste, and Yuri Pettinicchi (2018) "Can firms see into the future? Survey evidence from Germany," *Journal of Economic Behavior & Organization* 145, pp.66–79.

Tanaka, Mari, Nicholas Bloom, Joel M. David, and Maiko Koga (2018) "Firm performance and macro forecast accuracy," NBER Working Paper No. 24776.

Womack, Kent L. (1996) "Do brokerage analysts' recommendations have investment value?" *The Journal of Finance* 51, pp.137–167.

Table 1: Summary statistics

Variable	Mean	Standard Dev.	Min	Max	Observations
Forecast of GDP growth rate over the next 1 year	1.46	1.29	−2.80	5.50	28,131
Forecast of GDP growth rate over the next 3 years	1.75	1.09	−1.70	5.20	27,530
Forecast of GDP growth rate over the next 5 years	1.92	1.14	−10.00	15.00	27,448
Forecast of industry growth rate over the next 1 year	1.24	2.65	−9.00	11.30	26,321
Forecast of industry growth rate over the next 3 years	1.67	2.36	−6.90	10.30	26,023
Forecast of industry growth rate over the next 5 years	1.86	2.80	−40.00	32.80	26,163
Investment plans over the next 3 years	3.53	11.11	−30.00	30.00	29,479
Employment plans over the next 3 years	0.17	5.58	−20.00	20.00	25,317
ln(Market capitalization)	24.30	1.76	17.01	30.99	30,793
ln(PBR)	0.21	0.72	−2.88	6.25	14,686
Tobin's Q	1.10	1.45	0.13	11.44	22,471
Volatility of profit growth	83.62	105.09	0.02	918.89	16,531
Debt/Asset ratio	0.57	0.21	0.00	1.19	22,924

Table 2: Private information and stock returns in sectors over next one year

	(1)	(2)	(3)	(4)
	$\Delta r_{t+1}^{Sector_j}$	$\Delta r_{t+1}^{Sector_j}$	$\Delta r_{t+1}^{Sector_j}$	$\Delta r_{t+1}^{Sector_j}$
$\hat{\varepsilon}^1$	0.154***	0.154***	0.123**	0.123**
	(0.0581)	(0.0582)	(0.0572)	(0.0573)
$f_{t\to t+1}^{GDP}$		0.0844		0.0168
		(0.178)		(0.178)
DI_j^{Tankan}			0.148***	0.148***
			(0.0118)	(0.0118)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	21,936	21,936	21,936	21,936
R-squared	0.193	0.193	0.197	0.197
Number of Firms	2,397	2,397	2,397	2,397

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 3: Private information and stock returns in sectors over next three years

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$	$\Delta r_{t+3}^{Sector_j}$
$\hat{\varepsilon}^3$	0.578***	0.583***	0.528***	0.533***				
	(0.112)	(0.112)	(0.111)	(0.111)				
$\hat{\varepsilon}^1$					0.420***	0.433***	0.385***	0.397***
					(0.0972)	(0.0976)	(0.0968)	(0.0973)
$f_{t \to t+3}^{GDP}$		-0.264		-0.289		-0.267		-0.294
		(0.268)		(0.268)		(0.270)		(0.270)
DI_j^{Tankan}			0.162***	0.163***			0.160***	0.163***
			(0.0178)	(0.0178)			(0.0177)	(0.0178)
Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Observations	21,147	21,147	21,147	21,147	21,340	20,955	21,340	20,955
R-squared	0.188	0.188	0.191	0.191	0.189	0.187	0.191	0.189
Number of Firms	2,352	2,352	2,352	2,352	2,358	2,351	2,358	2,351

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 4: Private information and stock returns in sectors over next five years

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$	$\Delta r_{t+5}^{Sector_j}$
$\hat{\varepsilon}^5$	0.642***	0.639***	0.559***	0.557***				
	(0.129)	(0.129)	(0.124)	(0.124)				
$\hat{\varepsilon}^1$					0.511***	0.509***	0.428***	0.427***
					(0.120)	(0.123)	(0.116)	(0.118)
$f_{t\to t+5}^{GDP}$		0.192		0.148		0.215		0.167
		(0.276)		(0.274)		(0.295)		(0.292)
DI_j^{Tankan}			0.365***	0.365***			0.362***	0.362***
			(0.0254)	(0.0254)			(0.0256)	(0.0256)
Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Observations	20,427	20,427	20,427	20,427	20,300	19,847	20,300	19,847
R-squared	0.237	0.237	0.247	0.247	0.243	0.241	0.251	0.250
Number of Firms	2,302	2,302	2,302	2,302	2,301	2,296	2,301	2,296

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 5: Private information and stock returns in individual firms over next one year

	(1) $\Delta r_{t+1}^{Stock_i}$	(2) $\Delta r_{t+1}^{Stock_i}$	(3) $\Delta r_{t+1}^{Stock_i}$	(4) $\Delta r_{t+1}^{Stock_i}$
$\hat{\varepsilon}^1$	0.563***	0.563***	0.555***	0.556***
	(0.163)	(0.163)	(0.163)	(0.163)
$f_{t\to t+1}^{GDP}$		−0.228		−0.215
		(0.417)		(0.417)
$\ln(Size)$	−19.72***	−19.72***	−19.57***	−19.57***
	(1.191)	(1.192)	(1.202)	(1.202)
$\ln(PBR)$	−7.824***	−7.813***	−7.878***	−7.867***
	(1.403)	(1.403)	(1.412)	(1.412)
DI_j^{Tankan}			−0.0555*	−0.0553*
			(0.0292)	(0.0292)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	11,789	11,789	11,789	11,789
R-squared	0.296	0.296	0.296	0.296
Number of Firms	1,283	1,283	1,283	1,283

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 6: Private information and stock returns in individual firms over next three years

	(1) $\Delta r^{Stock_i}_{t+3}$	(2) $\Delta r^{Stock_i}_{t+3}$	(3) $\Delta r^{Stock_i}_{t+3}$	(4) $\Delta r^{Stock_i}_{t+3}$
$\hat{\varepsilon}^3$	0.544*	0.575**		
	(0.284)	(0.285)		
$\hat{\varepsilon}^1$			0.407	0.430*
			(0.251)	(0.251)
$f^{GDP}_{t\to t+3}$	0.979	0.937	0.968	0.929
	(0.645)	(0.643)	(0.677)	(0.675)
$\ln(Size)$	$-$47.09***	$-$47.56***	$-$47.40***	$-$47.88***
	(2.535)	(2.496)	(2.550)	(2.510)
$\ln(PBR)$	$-$10.30***	$-$10.16***	$-$10.45***	$-$10.30***
	(2.958)	(2.927)	(2.873)	(2.840)
DI^{Tankan}_j		0.172***		0.173***
		(0.0507)		(0.0518)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	11,639	11,639	11,545	11,545
R-squared	0.439	0.440	0.439	0.440
Number of Firms	1,276	1,276	1,277	1,277

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 7: Private information and stock returns in individual firms over next five years

	(1)	(2)	(3)	(4)
	$\Delta r_{t+5}^{Stock_i}$	$\Delta r_{t+5}^{Stock_i}$	$\Delta r_{t+5}^{Stock_i}$	$\Delta r_{t+5}^{Stock_i}$
$\hat{\varepsilon}^5$	0.375	0.403		
	(0.279)	(0.279)		
$\hat{\varepsilon}^1$			0.550*	0.572*
			(0.294)	(0.294)
$f_{t\rightarrow t+5}^{GDP}$	0.999*	0.977	1.099*	1.081*
	(0.607)	(0.607)	(0.648)	(0.648)
$\ln(Size)$	-66.86***	-67.36***	-66.10***	-66.65***
	(3.225)	(3.178)	(3.125)	(3.070)
$\ln(PBR)$	-11.63***	-11.42***	-12.33***	-12.08***
	(3.859)	(3.826)	(3.723)	(3.682)
DI_j^{Tankan}		0.165**		0.169**
		(0.0683)		(0.0681)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	10,925	10,925	10,660	10,660
R-squared	0.537	0.538	0.538	0.539
Number of Firms	1,223	1,223	1,220	1,220

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 8: Private information and investment plan

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$	$Inv_{t\to t+3}$
$\hat{\varepsilon}^3$	0.246***	0.247***	0.247***	0.247***	0.206***	0.207***	0.208***	0.207***
	(0.0629)	(0.0627)	(0.0627)	(0.0629)	(0.0635)	(0.0633)	(0.0633)	(0.0635)
$f^{GDP}_{t\to t+3}$		0.749***	0.744***			0.686***	0.683***	
		(0.123)	(0.123)			(0.128)	(0.128)	
DI^{Tankan}_j			0.0330***	0.0335***			0.0244***	0.0248***
			(0.00920)	(0.00924)			(0.00932)	(0.00935)
Tobin's Q	1.055***	1.054***	1.021***	1.021***	0.907***	0.905***	0.881***	0.882***
	(0.170)	(0.169)	(0.169)	(0.170)	(0.173)	(0.173)	(0.173)	(0.174)
Debt / Asset	−5.385***	−5.422***	−5.331***	−5.293***	−4.662***	−4.710***	−4.652***	−4.603***
	(1.403)	(1.396)	(1.398)	(1.404)	(1.538)	(1.534)	(1.537)	(1.541)
Cash flow /Asset					26.35***	26.06***	25.46***	25.74***
					(3.802)	(3.797)	(3.806)	(3.811)
Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Observations	17,937	17,937	17,937	17,937	17,142	17,142	17,142	17,142
R-squared	0.040	0.042	0.043	0.041	0.043	0.045	0.046	0.044
Number of Firms	2,331	2,331	2,331	2,331	2,261	2,261	2,261	2,261

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 9: Private information and employment plan

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$	$Emp_{t\to t+3}$
$\hat{\varepsilon}^3$	0.273***	0.273***	0.276***	0.275***	0.230***	0.231***	0.233***	0.233***
	(0.0350)	(0.0350)	(0.0352)	(0.0351)	(0.0347)	(0.0347)	(0.0349)	(0.0348)
$f^{GDP}_{t\to t+3}$		0.292***	0.293***			0.293***	0.293***	
		(0.0849)	(0.0850)			(0.0860)	(0.0861)	
DI^{Tankan}_j			0.0131**	0.0129**			0.0103*	0.0102*
			(0.00577)	(0.00579)			(0.00585)	(0.00587)
$\ln(Size)$					1.249***	1.244***	1.232***	1.237***
					(0.151)	(0.151)	(0.152)	(0.152)
Wage growth	0.00100	0.000985	0.000979	0.000994	0.000802	0.000786	0.000783	0.000798
	(0.00169)	(0.00170)	(0.00170)	(0.00168)	(0.00166)	(0.00168)	(0.00168)	(0.00166)
Labor market slackness	−0.0467***	−0.0461***	−0.0342***	−0.0349***	−0.0375***	−0.0370***	−0.0277***	−0.0283***
	(0.00833)	(0.00833)	(0.0100)	(0.0100)	(0.00832)	(0.00832)	(0.00997)	(0.00997)
Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES
Observations	11,012	11,012	11,012	11,012	10,798	10,798	10,798	10,798
R-squared	0.101	0.103	0.103	0.102	0.114	0.116	0.116	0.114
Number of Firms	1,685	1,685	1,685	1,685	1,650	1,650	1,650	1,650

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 10: Summary statistics of analyst coverage

From 2006 to 2015	# of coverage
Mean	2.54
Median	0.00
Maximum	27.00
Minimum	0.00
Standard deviation	4.33
Skewness	2.10
Kurtosis	7.06
Observations	9,615

Note: Data is obtained from Bloomberg

Table 11: Private information, analyst coverage, and stock returns in individual firms over next one year

	(1) $\Delta r_{t+1}^{Stock_i}$	(2) $\Delta r_{t+1}^{Stock_i}$	(3) $\Delta r_{t+1}^{Stock_i}$	(4) $\Delta r_{t+1}^{Stock_i}$
$\hat{\varepsilon}^1$	-0.357	-0.358	-0.444	-0.446
	(0.375)	(0.375)	(0.383)	(0.383)
$Dummy^{Coverage<Q_{25\%}}$	1.419	1.421	1.238	1.241
	(1.394)	(1.395)	(1.400)	(1.401)
$\hat{\varepsilon}^1 \times Dummy^{Coverage<Q_{25\%}}$	2.256***	2.258***	2.285***	2.288***
	(0.587)	(0.589)	(0.587)	(0.589)
$f_{t\rightarrow t+1}^{GDP}$		0.0736		0.118
		(0.609)		(0.610)
$\ln(Size)$	-37.76***	-37.75***	-37.33***	-37.31***
	(4.568)	(4.565)	(4.579)	(4.577)
$\ln(PBR)$	-11.88**	-11.89**	-11.41**	-11.43**
	(4.944)	(4.946)	(4.938)	(4.941)
DI_j^{Tankan}			-0.276***	-0.276***
			(0.0793)	(0.0793)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	3,563	3,563	3,563	3,563
R-squared	0.242	0.242	0.245	0.245
Number of Firms	995	995	995	995

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

Table 12: Private information, analyst coverage, and stock returns in individual firms over next three years

	(1)	(2)	(3)	(4)
	$\Delta r_{t+3}^{Stock_i}$	$\Delta r_{t+3}^{Stock_i}$	$\Delta r_{t+3}^{Stock_i}$	$\Delta r_{t+3}^{Stock_i}$
$\hat{\varepsilon}^3$	-0.263	-0.261	-0.231	-0.229
	(0.474)	(0.474)	(0.475)	(0.475)
$Dummy^{Coverage<Q_{25\%}}$	1.050	1.042	1.130	1.121
	(1.638)	(1.636)	(1.620)	(1.618)
$\hat{\varepsilon}^3 \times Dummy^{Coverage<Q_{25\%}}$	1.968**	1.957**	1.954**	1.943**
	(0.786)	(0.786)	(0.782)	(0.782)
$f_{t\to t+3}^{GDP}$		-0.801		-0.801
		(0.887)		(0.885)
$\ln(Size)$	-75.07***	-75.06***	-75.27***	-75.26***
	(6.464)	(6.471)	(6.466)	(6.473)
$\ln(PBR)$	-5.318	-5.277	-5.615	-5.574
	(6.627)	(6.642)	(6.588)	(6.603)
DI_j^{Tankan}			0.152	0.152
			(0.120)	(0.120)
Fixed Effect	YES	YES	YES	YES
Year Dummy	YES	YES	YES	YES
Observations	3,539	3,539	3,539	3,539
R-squared	0.419	0.419	0.419	0.419
Number of Firms	981	981	981	981

Note: Standard errors in parentheses are clustered at firm levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively.

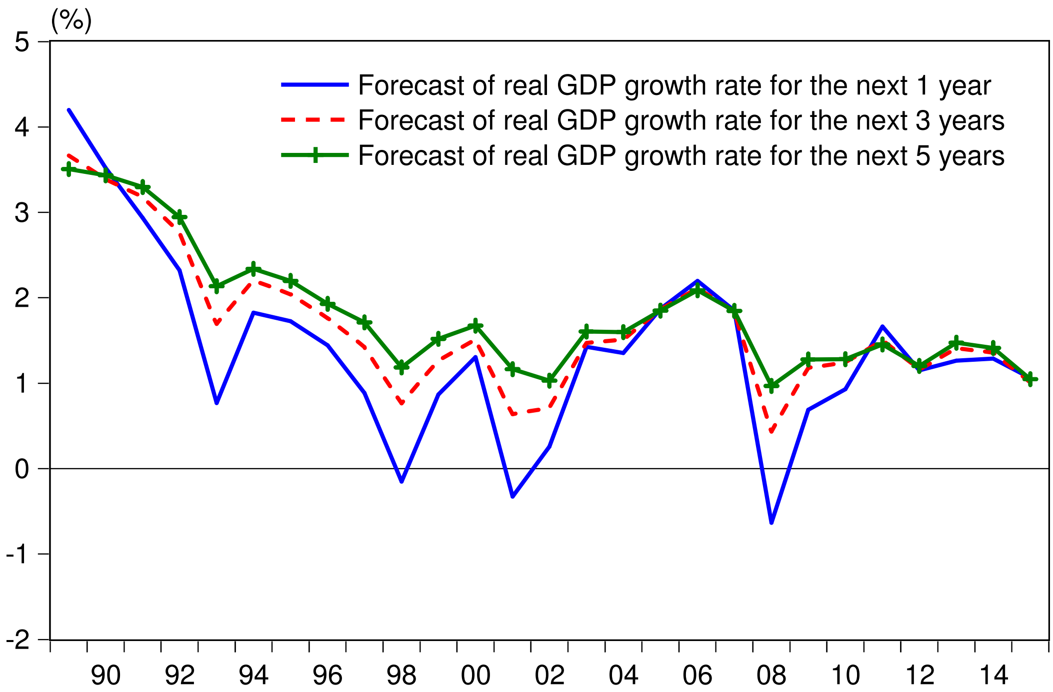

Figure 1: Firm forecasts for real GDP growth rate

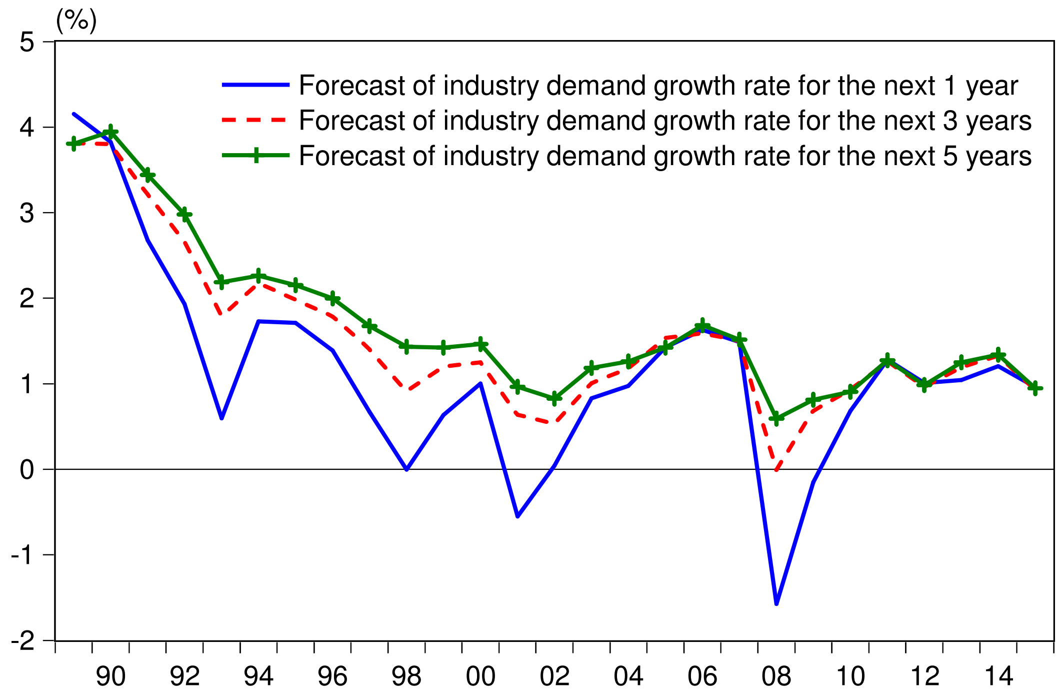

Figure 2: Firm forecasts for real growth rate of industry demand

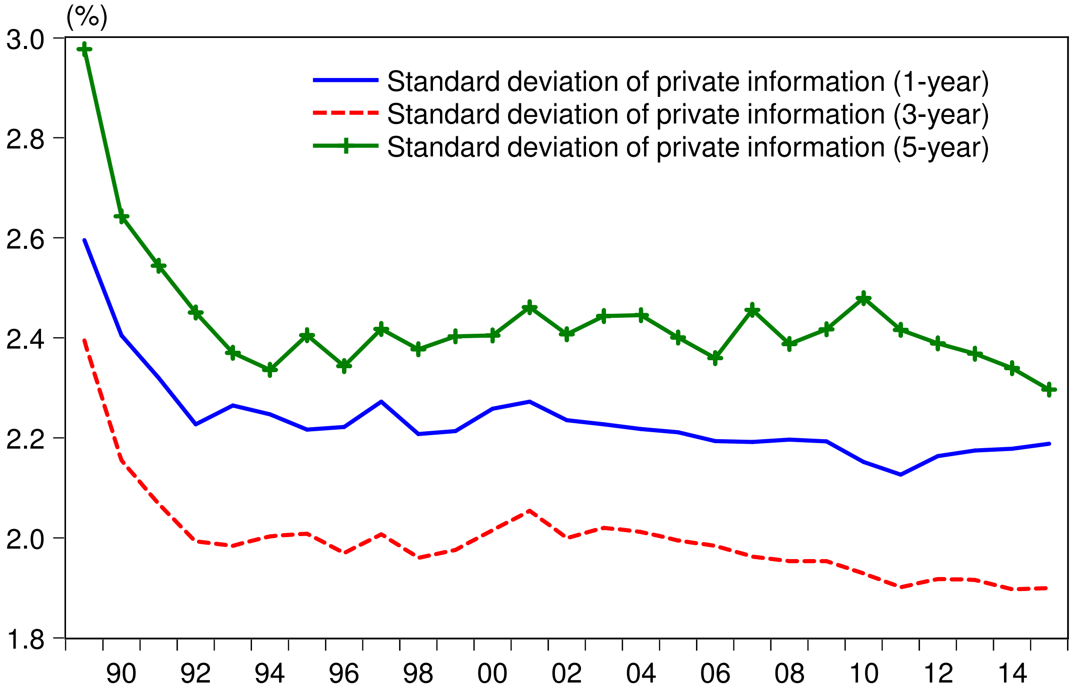

Figure 3: Standard deviations of the proxy for private information ($\hat{\varepsilon}^k_{i,t}$)

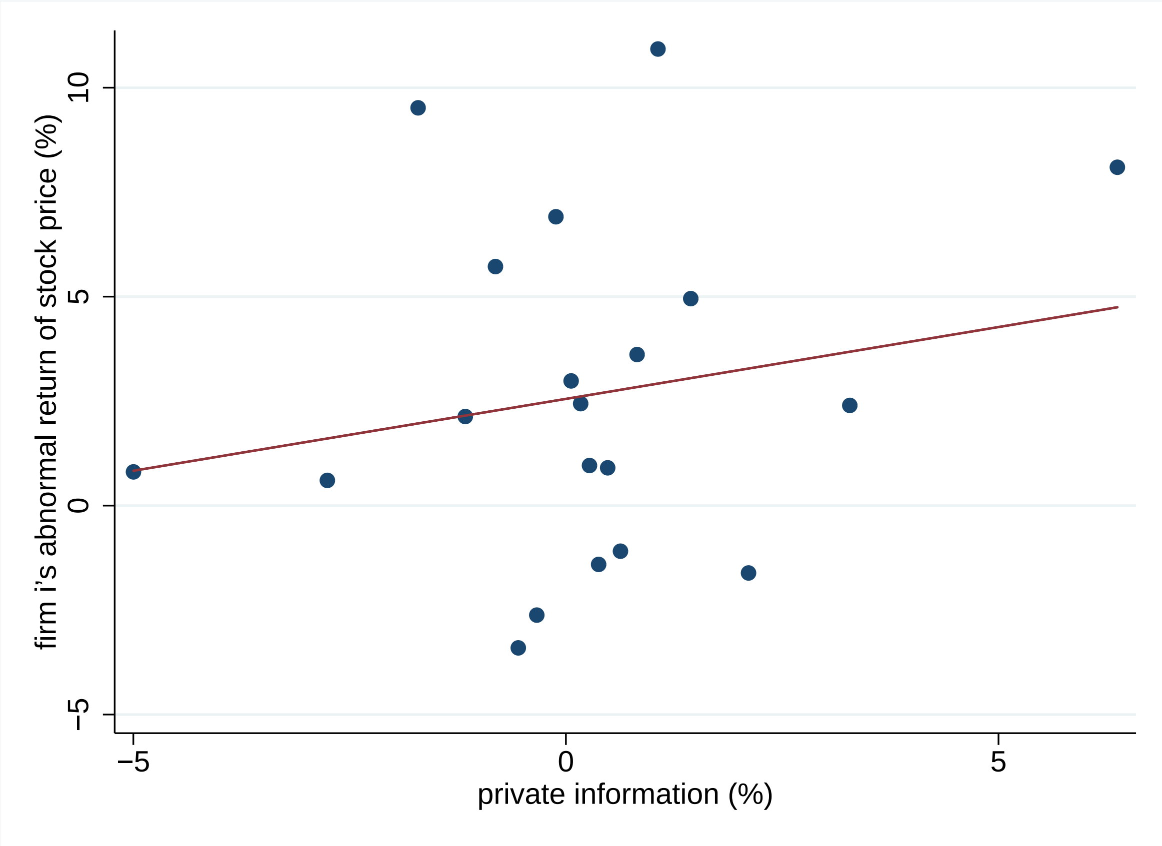

Figure 4: Binscattered plot of private information ($\hat{\varepsilon}^k_{i,t}$) and firm i's abnormal return of stock price when $\hat{\nu}_{i,t} < Q_{25\%}$