How do Institutional Investors Interact with Sell-Side Analysts?

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ABSTRACT

How do Institutional Investors Interact with Sell-Side Analysts?

This paper examines how institutional investors interact with sell-side analysts in Korean stock market. I focus on the role of institutional investors as sophisticated stock market participants who may analyze sell-side analysts’ information components as earnings forecast in addition to using their outputs as recommendation, target price. Furthermore, I examine whether institutional investors can differentiate good information from bad information provided by sell-side analysts. By using a sample of 1,421 firm/year observations in Korean stock market from 2001 to 2011, the results indicate that institutional investors may take an active role as a mechanism to incorporate V/P ratios (value to price) derived from earnings forecast information to analyze sell-side analysts’ information components as earnings forecast, in addition to using the outputs as Recommendation. Moreover, I find that institutional investors are more likely to use sell-side analysts’ information only when the earnings forecast is more accurate, meaning that institutional investors can differentiate the good information from bad information. On the other way round, I examine if institutional investors’ trading behavior affect the sell-side analysts’ information, and find that sell-side analysts do not use information produced from buy-side investors’ trading behavior. In sum, I can conclude that the main results support the causality relationship that institutional investors trade by looking at the sell-side analysts’ information components as earnings forecast in detail, and by using their information only when the earnings forecast information is more accurate, not the other way round. This study can shed some lights on the knowledge about the unobserved interaction between the most sophisticated stock market participants who are considered
to have taken a role to enhance stock market efficiency, and extend the prior literature which factors bring about institutional investors’ sophistication.

**Keywords:** Sell-side Analyst; Institutional Ownership; Residual Income Valuation Model; Target Prices; Stock Recommendations.
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I. INTRODUCTION

This study examines how institutional investors interact with sell-side analysts in Korean stock market. Lee (2001) shows that it takes time for stock price to converge upon intrinsic value of equity and that its convergence is achieved only at substantial social costs. Thus, a temporary divergence between stock price and intrinsic value of equity is inevitable. Given that efficient stock market is a necessary condition for the economically efficient allocation of social resources among firms, it is worthwhile to examine which factors either facilitate or impede stock price convergence toward intrinsic value of equity. Therefore, prior research examines if the role of the most sophisticated market participants such as sell-side analysts and the institutional investors is to enhance the market efficiency individually.

Prior studies regarding the role of information intermediaries suggest that sell-side analysts’ information, V/P ratio based on earnings forecasts, target prices and stock recommendations, can predict future stock returns (e.g., Frankel et al. 1998; Lee et al. 1999; Cha and Yoo 2010). These results imply that sell-side analysts provide a piece of information useful to facilitate stock price convergence toward intrinsic value of equity. However, sell-side analysts cannot accelerate stock price convergence toward intrinsic value of equity by themselves because they just provide stock market participants with information to guide their actual trading. Thus, there must be some stock market participants who actually trade stocks incorporating sell-side analysts’ information. That is, investors’ execution of sell-side analysts’ trading guidance as well as their information itself is essential to actually facilitate stock price convergence toward intrinsic value of equity.
In this study, I focus on the role of institutional investors as direct stock market participants who may incorporate overall sell-side analysts’ forecast information. This is because prior studies suggest that institutional investors outperform individual investors and also lead subsequent stock returns (e.g., Gompers and Metrick 2001; Nofsinger and sias 1999). Especially, I focus on the role of institutional investors as sophisticated stock market participants who may analyze sell-side analysts’ information components as earnings forecast in addition to using their explicit outputs such as recommendation, target price. Although Chen et al. (2006), Busse et al. (2012) find that a change in institutional ownership is positively correlated with the sell side analysts’ stock recommendations, there is no comprehensive study to show how institutional investors incorporate sell-side analysts’ information in detail or whether institutional investors have skills to process sell-side analysts’ information components in addition to using the explicit outputs such as recommendation, target price for their actual trading for Korean stock market.

According to the prior research, sell-side analysts’ recommendation is more optimistically biased to buy or strong buy recommendation than earnings forecasts information if they are affiliated or under investment banking pressure (Malmendier and Shanthikumar 2014). Moreover, sell-side analysts who work for brokerage equity house slowly downgrades to “Hold” or “Sell” and fast upgrades to “Buy”, but they update the earnings forecasts for the stock timely (Malmendier and Shanthikumar 2014; Kim and Eum 2006). Bradshaw (2004) shows that sell-side analysts’ recommendation does not fully incorporate estimated equity value derived from residual income model (V/P ratio). It’s because the influence of investment banking affects the transitional effect of sell side
analysts’ earnings forecast into recommendation. (Ertimur et al. 2007; Chen and Chen 2009; O’Brien et al. 2005). Therefore, I expect that earnings forecast information has additional information which the explicit outputs as recommendation do not contain, and investigate whether more sophisticated institutional investors use earnings forecast information to analyze the information components not just incorporating the explicit recommendation or target price.

Furthermore, I examine whether institutional investors can differentiate good information from bad information provided by sell-side analysts. Busse et al. (2012) use sell-side analysts’ recommendation to examine whether the institutional investors can see through the biased information, and conclude that the institutional investors cannot differentiate the good information with bad information provided by sell-side analysts in U.S. stock market. However, it has limitation to test if institutional investors can differentiate the sell-side analysts’ information because the recommendation measure has noise and could be more biased than earnings forecast. Accordingly, in this study, I examine whether institutional investors incorporate sell-side analysts’ forecast information only when the earnings forecast information is more accurate. Lastly, to support the causality relationship that the sell-side analysts provide institutional investors with useful information, I examine whether a change in institutional investors’ ownership affect the change of sell side analysts’ opinion, the other way round.

By using a sample of 1,421 firm/year observations in Korean stock market during year 2001 and 2011 (excluding year 2008 because only a few sell side analysts revise their earnings forecast, recommendation during global financial crisis (Song and Byun 2013)), I find that the change of institutional investor’s ownership during the year
has a significantly positive association with the level of equity value estimates based on sell-side analysts’ earnings forecasts relative to stock prices, in addition to recommendation at the beginning of the year. This result indicates that institutional investors increase their shares of equity for the firms for which analysts issue favorable information via their V/P ratios, meaning that institutional investors may take an active role as a mechanism to incorporate V/P ratios (value to price) derived from earnings forecast information to analyze the information components, in addition to using the outputs as recommendation. Second, I find that only when sell side analysts provide more accurate earnings forecast, the institutional investors are more likely to use earnings forecast information with recommendation. It implies that institutional investors can differentiate the good information from bad information provided by sell-side analysts. On the other way round, I find that sell-side analysts do not use information produced from buy-side investors’ trading behavior. In sum, I can conclude that the main results support the causality relationship that institutional investors trade by looking at the sell-side analysts’ information contents in detail, and by using their information only when the earnings forecast information is more accurate, not the other way round.

In the sensitivity test, I find that the main result remains unchanged when I use OJ, PEG valuation model \((VOJ/P, VPEG/P)\), and earnings per share forecast itself \((EPS/P)\). According to the prior research that shows the return profitability of a change in sell-side analysts’ target price or recommendation (Bradshaw et al. 2012; Jegadeesh et al. 2006), I use a change in sell side analysts’ information rather than level of information at the beginning of the year, and find that the institutional investors incorporate a change in V/P ratios in addition to a change in recommendation during the year.
This study makes several important contributions to the literature as follows. First, this study can shed some lights on how both sophisticated stock market participants interact together. I suggest that information flows from sell-side analysts to institutional investors, not the other way round. Second, this paper extends the prior literature which factors bring about institutional investors’ sophistication. This paper finds the active role of the institutional investors as a mechanism to incorporate earnings forecast information in addition to explicit outputs as recommendation. Moreover, the results report that institutional investors selectively incorporate sell-side analysts’ information only when the quality of information is high. Taken together, I believe that this study enhances the knowledge about the unobserved interaction between important stock market participants who are considered to have taken a role to enhance stock market efficiency.

The remainder of the paper is as follows. Section 2 briefly reviews prior studies and develops the hypotheses. Section 3 describes the research method and the sample selection. Section 4 presents the empirical findings. Section 5 presents the sensitivity test. Finally, Section 6 concludes.
II. BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Prior Literatures

This study is related to the interaction between the sell-side analysts and the institutional investors who are the most sophisticated stock market participants. The main research question about the role of sell side analysts or institutional investors in the stock market is related to several recent papers.

The first stream of research is about the role of sell side analysts who enhance market efficiency in the stock market. As of the prior research about the impact of the analysts’ earnings forecasts on the market efficiency, many research examined how the sell-side analysts as an information intermediary provide information to the investors and how they affect the stock market efficiency. Also, the prior literature examines the comparability of the ability of the analyst’s earnings forecasts and that of time-series models. Brown, Hagerman, Griffin, and Zmijewski (1987) suggest that the sell-side analysts’ prediction for the firms’ earnings is superior to the univariate time-series models. Moreover, Stickel (1991) examines whether the analysts’ forecast revision improves the investor’s investment strategy, and Gleason and Lee (2003) find that the additional analyst coverage facilitates the faster stock price adjustment with the analysts’ forecast revisions. Other research such as Elgers et al. (2001) suggest that the ratio of the price to analysts’ earnings forecast predicts future stock returns. Frankel and Lee (1998) tell us that analyst earnings forecasts based valuation model (V/P ratio) can predict future U.S. stock returns better than book to market, firm size. Lee et al. (1999) also assume that the stock price and the intrinsic value are not equal but converge over the long period and suggest that the value estimates using the analyst forecast rather than the historical
earnings is a better predictor. Ali, Hwang, and Trombley (2003) also examine that the V/P ratio effect suggested in Frankel et al. (1998) is derived from the market mispricing rather than the omitted risk factor. Cha and Yoo (2010) also show that sell side analysts’ summary information can predict future stock returns in Korean stock market. In other words, sell side analysts can provide stock information to market participants and their information, in turn, contribute to predict future stock returns. Furthermore, many researches examine the return profitability of sell side analysts’ recommendation. Womack (1996) find that the analysts’ recommendation of upgrades and downgrades can predict the future abnormal returns. Jegadeesh et al. (2006) analyzes that the analysts’ recommendation revisions contain predictive information and find that upgraded recommendations are associated with positive future stock returns. Barber, Lehavy, McNichols, and Trueman (2001) conclude that the strategy to buy the stocks with the strong buy recommendation leads to the positive abnormal returns. Target Price information also contains informative information to predict future stock return. Prior research examines the return predictability of target prices. Brav and Lehavy (2003) show that the stock market reacts to the sell side analysts’ target price revision when controlling the reaction to the stock recommendation or the earnings forecast information provided by the sell side analysts. Asquith, Mikhail, and Au (2005) find that the target price revisions can explain the variation in price. Bianchini et al. (2008) and Bradshaw et al. (2012) also conclude that the target price and it change can lead to the positive stock return in the future. Kim and Eum (2006) investigate the impact of the sell side analysts’ stock recommendation and the target price revision in Korean stock market, and they find that the information provided by the analysts significantly affect the stock price. In sum,
prior U.S. and Korean literatures regard sell side analysts as an information intermediary and they have a crucial role to facilitate stock price convergence toward intrinsic value of equity to enhance stock market efficiency.

However, for a stock price convergence toward intrinsic value of equity, there should be a role of investors who actually trade stocks incorporating sell side analysts’ information. The second stream of research is about the role of institutional investors in the stock market. Many recent studies suggest that institutional investors are regarded as sophisticated investors in stock market and their trading predict the future stock returns. Sias, Starks, and Titman (2001) find that the institutional investors lead the stock price variation and perform better than the individual investors. Odean (1999) suggests that the individual investors’ portfolio does not outperform the market benchmark. Institutional investors are better to analyze and understand the information than individual investors because institutional investors can access the information of company easier and monitor the management at a lower cost than individual investors (Barber and Odean 2008; Kang and Stulz 1997). Gompers and Metrick (2001) find that institutional investors nearly doubled their share of the stock from 1980 to 1996, and the level of institutional ownership in a stock can help forecast its future stock returns due to the compositional shift in ownership towards in institutional investors. Yan and Zhang (2009) conclude that the association between the institutional predictive ability and the abnormal return suggested by Gompers and Metrick (2001) is derived from the short-term institutional investors. Nofsinger and Sias (1999) also find that strong positive (+) correlation between annual changes in institutional ownership and returns over the herding interval contrary to individual ownership. More precisely, firms with the largest increases in institutional
ownership outperform firms with the largest decreases in institutional ownership by 5.43% in the following year. Grinblatt and Keloharju (2000) study about Finland stock market that institutional investors are sophisticated to pick up more attractive stocks whereas individual investors are overly eager to cash out on winning stocks or to buy losing stocks or both. Jiambalvo et al. (2002) finds that the extent to which stock prices lead earnings is positively related to the percentage of institutional ownership and results hold even after control for endogenous portfolio choices of institutional investors. Bae and Park (2007) find a significantly positive association between institutional ownership and subsequent stock returns for Korean listed company during from 2000 to 2004. Kim and Cheon (2004) find that the foreign and domestic investors acquire positive returns with superior information advantage.

Although many prior literatures show institutional investors’ superior performance to individual investors, which factors bring about institutional sophistication can be essential topic in accounting and finance literatures. Prior papers figure why institutional investor is sophisticated by herding or momentum trading (e.g., Wermers 1999; Chen et al. 2000); however, there is little research that examines whether institutional investors interact with sell-side analysts.

### 2.2 Hypothesis development

To test how institutional investors and sell side analysts interacts empirically, I focus on sell-side analysts’ information as factors that enhance the institutional investors’ sophistication, and to support the causality relationship I focus on the institutional investors’ information contents that affect sell-side analysts’ opinion.
Institutional investors and sell-side analysts are the most sophisticated stock market participants in capital market, and the understanding of how they interact together is of fundamental importance. One of the distinct channels of their interaction may be described as follows. Sell-side analysts receive, process information from diverse sources, communicating it to institutional investors in concise forms such as earnings forecasts, stock recommendations and target prices, and then institutional investors would reflect this sell-side analyst’s information through actual stock trading. Groysberg et al. (2013) suggest that buy-side analysts cover more stocks than sell-side analysts, so buy-side analysts’ reports issue less accurate, informative and more biased information than those of sell side-analysts. An anecdotal evidence shows that institutional investors’ main equity research resources are provided by brokerage firm and investment banking with sell-side analysts in exchange of trading commission (Cheng et al. 2006; Irvine 2004). In practice, institutional investors and sell-side analysts have luncheon meeting, conference call together, and sell-side equity research provides service when they participate in investor relation meeting and meet the management of firms together, and the institutional investors spend time to study company or related industry in-depth report provided by sell-side analysts, and make decision (Cheng et al. 2006). Therefore, institutional investors are likely to incorporate forecast information provided by sell-side analysts.

According to the prior literature, Frankel et al. (1998) show that using earnings-based valuation model to derive a more precise estimate of V using I/B/E/S consensus forecasts, and examine whether a more complete valuation model is superior power to predict risk adjusted return. Specifically, they examine the level of the ratio of
the intrinsic value calculated from the earnings based valuation models reflecting sell side analyst earnings forecasts to stock prices (hereafter V/P ratio). V/P ratio captures the joint effects of the reasonableness of the implementation of earnings-based valuation models as well as the informativeness of sell side analysts’ earnings forecasts in picking up more attractive stocks. That is, a higher (lower) level of the V/P ratio may indicate that the current stock price is understated (overstated). In consistent with Frankel and Lee (1998), Cha and Yoo (2010) conclude that V/P ratios predict future stock return better than target price and recommendation, which means that V/P ratio based on the earnings forecast contains informative information in addition to analysts’ reported information (e.g., target price and recommendation). Womack (1996) find that the analysts’ recommendation of upgrades and downgrades can predict the future abnormal returns. Jegadeesh et al. (2006) analyzes that the analysts’ recommendation revisions contain predictive information and find that upgraded recommendations are associated with positive future stock returns. Barber, Lehavy, McNichols, and Trueman (2001) conclude that the strategy to buy the stocks with the strong buy recommendation leads to the positive abnormal returns. Contrary to earnings forecasts or stock recommendations, there is little research has been done about target prices. Kim and Um (2006) shows that change of analyst’s target prices are significantly positive association with subsequent stock prices in Korean stock market. Therefore, in this study, I explore an empirical test about how institutional investors incorporate sell-side analysts’ forecast information in their real valuation procedure.

Sell-side analysts have incentive to provide optimistically biased estimates with conflicts of interest. Sell-side analysts’ recommendation is more optimistically
biased to buy or strong buy recommendation than earnings forecasts information if they are affiliated or under investment banking pressure (Malmendier and Shanthikumar 2014). Moreover, sell-side analysts who work for brokerage equity house slowly downgrades to “Hold” or “Sell” and fast upgrades to “Buy”, but they update the earnings forecasts for the stock timely (Malmendier and Shanthikumar 2014; Kim and Eum 2006). Bradshaw (2004) shows that sell-side analysts’ recommendation does not fully incorporate estimated equity value derived from residual income model (V/P ratio). It’s because the influence of investment banking affects the transitional effect of sell side analysts’ earnings forecast into recommendation. (Ertimur et al. 2007; Chen and Chen 2009; O’Brien et al. 2005). Cha and Yoo (2010) find that earnings forecast information (V/P ratios) predict future stock return better than target price and recommendation, which means that V/P ratio based on the earnings forecast contains informative information in addition to analysts’ reported information (e.g., target price and recommendation).

Therefore, I expect that earnings forecast information has additional information which the explicit outputs as recommendation do not contain.

According to the prior research, institutional investors are better to analyze and understand the information than individual investors because institutional investors can access the information of company easier and monitor the management at a lower cost than individual investors (Barber and Odean 2008; Kang and Stulz 1997). Accordingly, I expect that institutional investors may analyze sell-side analysts’ stock valuation process in addition to using their explicit outputs such as recommendation, target price. Therefore, it is necessary to investigate whether more sophisticated institutional investors use earnings forecast information (V/P ratio) to analyze the whole valuation process in
addition to incorporating explicit recommendation, target price. I assume that if there is
the same investment opportunity to the institutional investors, they would buy the
relatively high V/P ratio stocks. However, if institutional investors use their own
investment procedure rather than using sell side analysts’ earnings forecasts, no
association between change of institutional ownerships and the level of V/P ratio would
be possible. This study can suggest empirical evidence about how sell side analysts’
information is actively used for institutional investors’ real investment procedure in
Korea. So this paper tests an alternative form of hypotheses as follows.

\[ H_1: \text{There is an empirically positive (+) association between the analysts’}
\]
\[ \text{forecast information (V/P ratios, target price, recommendation) and the}
\]
\[ \text{change of institutional investor’s ownerships.}
\]

The sell-side analysts have conflicts of interest to provide optimistically biased
information (Irvine 2001, 2004). Therefore, it is necessary to examine if the institutional
investors can differentiate the quality of sell-side analysts’ forecast information and select
the more useful information. According to Loh and Mian (2006), if the sell-side analysts’
earnings forecast is more accurate, the return of investment strategy based on
recommendation is higher. Cheng et al. (2006) finds that buy side investors are more
dependent on sell-side analysts’ forecast information when the sell side analysts’ forecast
information is more accurate based on their survey. Accordingly, I predict that only when
the sell-side analysts’ forecast information provides more accurate earnings forecast, the
institutional investors may take an active role as a mechanism to incorporate the sell-side
analysts’ forecast information. Thus, for the second hypothesis I examine if the institutional investors are more likely to take an active role as a mechanism to use the analysts’ forecast information only when the sell-side analysts provides more accurate earnings forecast.

\[ H_2: \text{The institutional investors incorporate the analysts' forecast information only when the analysts’ earnings forecast is more accurate.} \]
III. RESEARCH DESIGN AND VARIABLE MEASUREMENT

3.1 V/P ratio in Earnings-Based Valuation Model

I consider the representative residual income models which have been widely used in the prior research (Liu, Nissim, and Thomas 2002). Accounting researchers use the residual income valuation model (RIV) because RIV model links the equity value to the firm’s accounting information with the clean surplus relation (Ohlson 1995). The RIV model (VRIVC and VRIVI) approach is that the equity value of the firm is the sum of the book value of today and the present value of the future residual earnings. Even though the abnormal earnings for years 1 through 3 resulting from the earnings forecast are same for VRIVC and VRIVI, the assumption for the terminal value is different.

The first RIV model (VRIVC) I consider assumes that the residual earnings remain constant after year 2 (Frankel and Lee 1998; Lee et al. 1999; Liu et al. 2002; Ali et al. 2003; Jorgensen, lee and yoo 2011). I compute the future book values by using the ex-ante clean surplus relation in which the book value in the future year equals the beginning book value and the estimated earnings less the estimated dividends.

\[
V_{RIVC} = b_{V_1} + \sum_{i=1}^{2} \left( \frac{E_i (e_{ps_{t+1}} - r_t \times b_{V_{t+1}})}{(1 + r_t)^i} \right) + \frac{E_i (e_{ps_{t+2}} - r_t \times b_{V_{t+1}})}{r_t \times (1 + r_t)^2}
\]

Where:
- \( b_{V_t} \) = the book value per share at year \( t \);
- \( e_{ps_t} \) = the earnings per share during year \( t \); and
- \( r_t \) = the cost of capital at year \( t \).

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1 We consider mainly value estimates derived from the residual income valuation model (VRIVC and VRIVI) because Jorgensen, lee and yoo (2011) shows that the accuracy of equity value estimates from the abnormal earnings growth model (VOJ) is lower than VRIVC and VRIVI. In the sensitivity test, we also use VOJ, VPEG and the result maintains.
The second RIV model (VRIVI) I use has the assumption that the profitability of the firm measured with return on equity trends linearly from the level computed from the earnings per share forecasts of the 3rd year into the industry median return on equity by 12th year, and after 12th year the residual income is constant. According to Liu et al. (2002), I winsorize the median ROE in the industry at the risk free rate and 20 percent to remove the outliers.

\[ V_{RIVI} = bv_t + \sum_{s=1}^{2} \left( E_s (eps_{s+t} - r_t \times bv_{t+s-1}) \right) + \sum_{s=3}^{12} \left[ E_s (ROE_{s+t} - r_t) \times bv_{t+s-1} \right] + E_{12} (ROE_{12+t} - r_t) \times bv_{t+12} \]

Where: 
\( ROE_t = \) the return on equity during year t.

3.2 Regression Equation

3.2.1 The association between the institutional investors and sell side analysts’ forecast information

To examine if the institutional ownership is positively associated with level of V/P ratios, target prices or stock recommendation, I use the change of the institutional ownership as dependent variable, and the analysts’ forecast information (V/P ratio, target price, recommendation) as independent variables. As independent variables, I use \( VRIVC/P, VRIVI/P, \) which are the value estimates derived from the residual income valuation model using the analysts’ earnings forecasts, and \( V_{AVER}/P, \) mean value of \( VRIVC/P \) and \( VRIVI/P \) to reduce the error. Also, target prices scaled by the stock price and stock recommendations at the beginning of the year are used. I use stock recommendations from the majority of Korean brokerage house and classify them into five categories “Strong Buy,” “Buy,”
“Hold,” “Sell,” and “Strong Sell.” ranging from 1 to 5 (1 = Strong Sell, 2 = Sell, 3 = Hold, 4 = Buy, and 5 = Strong Buy).

To analyze the association between the sell side analysts’ information and the institutional investors, I should control the other factors that might affect the institutional ownership change following the prior research. Prior research find that the stock characteristics that affect the institutional investors’ decision making are risk factors (beta), the investment constraints (dividend yield), stock liquidity (firm size, turnover), glamour or value stock (book to market ratio), leverage effect(leverage), and return momentum (return in the previous year) (Chen and Cheng 2006; Gompers and Metrick 2001). Institutional investors prefer lower return volatile, higher dividend yield because institutional investors are restricted to the prudence fiduciary motive regulation, and more liquid, larger because of the information environment and the transaction cost (Gompers and Metrick 2001). Thus, we include beta (BETA), dividend yield (YIELD), firm size (lnSIZE), and turnover (VOLUME). Jegadeesh et al. (2004) find that the institutional investors are more likely to invest in glamour stocks than value stocks because it is short to earn intended positive stock returns investing in value stocks, so we include book to market ratio (lnB/M). The prior empirical study finds that institutional investors buy stocks which have positive momentum (Grinblatt, Titman, & Wermers 1995; Jegadeesh et al. 2004), and we include past stock return (Lag(Ret12)). Moreover, I include leverage (LEVERAGE) because the institutional investor ownership is negatively related to leverage stocks (Bathala, Moon, and Rao 1994). The regression model includes the year dummies and the industry dummies to control the variability of the change of the institutional ownership by the year and the industry.
\[ \Delta \text{INSTIT} = \beta_0 + \beta_1 \text{Analysts’ forecast information} \left( V_{RIVC}/P, V_{RIVI}/P, V_{AVER}/P, \right. \\
\quad \quad \quad \left. \text{TARGET}/P, \text{RECOM} \right) + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} \\
\quad \quad \quad + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \\
\quad \quad \quad + \beta_8 \text{Lag(RET12)} + \text{Year Dummies} + \text{Industry Dummies} + \varepsilon \]

\[ \Delta \text{INSTIT} = \beta_0 + \beta_1 V_{RIVC}/P \left( V_{RIVI}/P, V_{AVER}/P \right) + \beta_2 \text{TARGET}/P + \beta_3 \text{RECOM} \\
\quad \quad \quad + \beta_4 \ln \text{SIZE} + \beta_5 \text{YIELD} + \beta_6 \text{BETA} + \beta_7 \ln \text{B/M} + \beta_8 \text{LEVERAGE} \\
\quad \quad \quad + \beta_9 \text{VOLUME} + \beta_{10} \text{Lag(RET12)} + \text{Year Dummies} + \text{Industry Dummies} + \varepsilon \]

Where:
\[ \Delta \text{INSTIT} = \text{a change in institutional ownership for the year after the analysts’ earnings forecasts disclosed at the beginning of the year;} \]
\[ V_{RIVC} \text{ and } V_{RIVI} = \text{the equity value estimates inferred from analysts’ earnings forecasts from the RIVC and RIVI model at the beginning of the year respectively;} \]
\[ V_{AVER} = \text{the average amount of previous 2 equity value estimates} \]
\[ (V_{RIVC} \text{ and } V_{RIVI}); \]
\[ \text{TARGET} = \text{the analysts’ target price divided by the stock price at the beginning of the year;} \]
\[ \text{RECOM} = \text{the analysts’ stock recommendation at the beginning of the year} \]
\[ (1 = \text{Strong Sell}, 2 = \text{Sell}, 3 = \text{Hold}, 4 = \text{Buy}, \text{and } 5 = \text{Strong Buy}); \]
\[ \ln \text{SIZE} = \text{the natural log of the market value of equity;} \]
\[ \text{YIELD} = \text{the dividend per share divided by stock price at the beginning of year;} \]
\[ \text{BETA} = \text{the systematic risk estimated by regressing at least 30 prior monthly stock returns up to 60 prior monthly returns against the corresponding market index;} \]
\[ \ln \text{B/M} = \text{the natural log of book value of equity divided by market value of equity;} \]
\[ \text{LEVERAGE} = \text{total liability divided by total asset;} \]
\[ \text{VOLUME} = \text{the average of the ratio of daily trading volume, divided by the number of shares outstanding;} \]
\[ \text{Lag(RET12)} = \text{the stock return of each firm for the previous year after the analysts’ earnings forecasts disclosed at the beginning of the previous year;} \]
\[ \text{Year Dummies} = \text{year dummies;} \]
\[ \text{Industry Dummies} = \text{industry dummies using the 2 digit industry code;} \]
\[ \varepsilon = \text{error term;} \]
3.2.2 The impact of institutional ownership change on a change in sell side analysts’ information

This paper examines the interaction between the institutional investors and the sell-side analysts’ information. To support the idea the sell-side analysts provide institutional investors with useful information, in this section I examine whether a change in institutional investors’ ownership affect the change of sell side analysts’ opinion, the other way round.

I regress a change in sell side analysts’ forecast information during the year as dependent variables ($\Delta V_{RIVC/P}, \Delta V_{RIVI/P}, \Delta V_{AVER/P}, \Delta TARGET/P, \text{and} \Delta RECOM$) on a change in institutional ownership for the previous year.

According to Ali and Hwang (2003), V/P ratio is related to risk proxies. Thus, I control (non)systematic risk of stock price variability ($BETA, IDRISK$; Fama and French 1993), market value of the equity as market environment because the risk is high when the firm size is small ($lnSIZE$; Amihud and Mendelson 1986), book to market ratio which relates with future return ($lnB/M$; Fama and French 1993), debt to market ratio because firm high leverage leads firm risk increase ($lnD/M$; Modigliani and Miller 1958), and the standard deviation of operating income ($OIVOL$; Barth, Beaver, Hand, and Landsman 1999).

$$\Delta \text{Analysts’ information} (\Delta V_{RIVC/P}, \Delta V_{RIVI/P}, \Delta V_{AVER/P}, \Delta TARGET/P, \Delta RECOM )$$

$$= \beta_0 + \beta_1 \text{Lag}(\Delta \text{INSTIT}) + \beta_2 \text{lnSIZE} + \beta_3 BETA + \beta_4 IDRISK + \beta_5 OIVOL$$

$$+ \beta_6 lnB/M + \beta_7 lnD/M + \text{Year Dummies} + \text{Industry Dummies} + \epsilon$$

Where:
$\Delta V_{RIVC}$ and $\Delta V_{RIVI}$ = a change of the equity value estimates inferred from
analysts’ earnings forecasts from the RIVC and RIVI model;
\[ \Delta V_{\text{AVER}} = \text{a change of the average amount of previous 2 equity value estimates during the year;} \]
\[ \Delta TARGET = \text{a change of the analysts’ target price during the year;} \]
\[ P = \text{the stock price at the end of December of each year;} \]
\[ \Delta RECOM = \text{a change of the analysts’ stock recommendation (1 = Strong Sell, 2 = Sell, 3 = Hold, 4 = Buy, and 5 = Strong Buy) during the year;} \]
\[ \text{Lag}(\Delta \text{INSTIT}) = \text{a change in institutional ownership for the year after the analysts’ earnings forecasts disclosed during the previous year;} \]
\[ \ln SIZE = \text{the natural log of the market value of equity;} \]
\[ BETA = \text{the systematic risk estimated by regressing at least 30 prior monthly stock returns up to 60 prior monthly returns against the corresponding market index;} \]
\[ IDRISK = \text{the idiosyncratic risk, which is measured as the variance of residuals from the regressions of BETA estimation;} \]
\[ OIVOL = \text{the standard deviation of operating income during at least past two years up to five years, scaled by average total asset;} \]
\[ \ln B/M = \text{the natural log of book value of equity divided by market value of equity;} \]
\[ \ln D/M = \text{the natural log of book value of debt divided by market value of equity;} \]
\[ \text{Year Dummies} = \text{year dummies;} \]
\[ \text{Industry Dummies} = \text{industry dummies using the 2 digit industry code;} \]
\[ \varepsilon = \text{error term.} \]

3.3 Sample Selection

The empirical analysis is based on a sample of Korean firms from 2001 to 2011, and excluded year 2008 because only a few sell side analysts revised their stock earnings forecasts and recommendations during global financial crisis in 2008 (Song and Byun 2013), and did not play their role appropriately as information intermediaries.

I extract accounting and stock return data from the Korea Information Service Value (hereafter KisValue) database, Korean and foreign institutional ownership database,
and analysts’ earnings forecasts data from the Fn-Guide database.\(^2\) In addition, I use the three-year government bond rate as a proxy for the risk-free rate from the Economic Statistics System of the Bank of Korea. According to prior research, I forecast beta with monthly stock returns and market returns over the 60 month period Liu et al. 2002). As of the end of each year, I select firm-years that satisfy the following criteria:

1. financial statement data, which is required for the computation of the main variables, industry identification codes and stock return data are available from KisValue;
2. stock price, mean of one-year-ahead, two-year-ahead, and three-year-ahead analysts’ earnings forecasts are available from Fn-Guide;
3. all of the risk proxies are available;
4. non-financial firm;
5. fiscal year-end is December;
6. one-year-ahead and two-year-ahead analysts’ earnings forecasts are positive;
7. the book value of equity is positive.

This process yields a final sample of 1,421 firm-year observations from KSE/KOSDAQ listing firms between 2001 and 2011.\(^3\) It is this final sample that is used for the descriptive statistics shown in Table 1.\(^4\)

\(^2\) Fn-Guide was founded in July, 2000. It gathers and compiles different estimates made by stock analysts, who are engaged in 37 security companies in Korea, regarding the future earnings, sales, revenues, and so forth of Korean firms. It provides the consensus of analysts’ earnings forecasts, which is the mean of the future earnings estimates of the analysts covering a firm. It provides the institutional investor ownership database until 2011.

\(^3\) This is because the Fn-Guide provides the data of analysts’ earnings forecasts only from 2001, and institutional investor ownership data until 2011.

\(^4\) To mitigate the effect of outliers, regressors are winsorized at 5% and 95% of the pooled distributions.
IV. MAIN RESULTS

4.1 Descriptive Statistics and Univariate Analysis

Descriptive statistics of the final sample are reported in Table 1. The mean value of the change of the institutional ownership is 0.5% and the mean value of the stock return is 25.5% for a year in Korean stock market. The mean values derived from the RIV model scaled by the stock price, $V_{RIVc}/P$, $V_{RIV}/P$, $V_{AVER}/P$ are 1.571, 2.113, and 1.854 respectively. The result might imply that the stock values are overestimated. However, as the prior research (Cha and Yoo 2010), I interpret that when V/P ratio is higher than one, the present stock price ($P$) is undervalued in the stock market.

The mean value of target price to stock price ($TARGET$) is 1.209, meaning that the sell side analysts evaluate the stock price as undervalued by 21% on average. The average of the stock recommendation (3.701) suggests that the sell side analysts encourage the investors to buy the stock. The optimistic bias stock recommendation is consistent with the prior research in Korean capital market (Kho and Kim 2007; Cha and Yoo 2010).

The descriptive statistics also report the distribution of the control variables as follows. The mean value (standard deviation) of the control variables of market value ($SIZE$), dividend yield ($YIELD$), leverage ($LEV$), daily trading volume to outstanding shares ($VOLUME$), and stock return of the previous year ($lRET12$) are 1,915 billion Korean won (3,095), 0.020 (0.016), 0.439 (0.171), 0.008 (0.006), and 0.413 (0.645). The mean value of the risk proxies, systematic risk ($BETA$), idiosyncratic risk ($IDRISK$), the standard deviation of operating income ($OIVOL$), book to market ratio ($B/M$), and debt to
market value \((D/M)\) are 0.982 (0.354), 0.018 (0.011), 0.028 (0.019), 1.251 (0.902), and 1.259 (1.335) respectively.

Table 2 shows Pearson correlation coefficients between the key variables. The main variable of the stock return \((RET12)\) is positively correlated with the analysts’ forecast information \((VRIVC/P (0.299), VRIVI/P (0.228), V_AVER/P (0.264))\) consistent with the prior research (Cha and Yoo 2010). The association between the change of the institutional investors’ ownership \((ΔINSTIT)\) and the stock return \((RET12)\) is significantly positive (0.280), which is consistent with prior research (Gompers and Metrick 2001). The results imply that analysts’ forecast information and the institutional investors predict the future stock return and improve the market efficiency. Moreover, the correlation between the change of institutional ownership and level of V/P ratios \((VRIVC/P, VRIVI/P, \text{ and } V_AVER/P)\) and target price \((TARGET)\) is significantly positive at 1% significance level. This shows that the institutional investors use the sell side analysts’ forecast information \((VRIVC/P, VRIVI/P, V_AVER/P, \text{ and } TARGET)\) and react on it. Several correlations between analysts’ forecast information follow the previous research of Cha and Yoo (2010). I find significantly positive correlation among the V/P ratios \((VRIVC/P, VRIVI/P, \text{ and } V_AVER/P)\) ranging from 0.786 to 0.971. Also, the association between target price and V/P ratios are significant ranging from 0.093 to 0.270. The relation between target price and stock recommendation is also significantly positive (0.309).
Table 1. Descriptive Statistics

This table presents the distributions of main variables used in this study. RET12 is the stock return of each firm for the year after the analysts’ earnings forecasts disclosed at the beginning of the year. ΔINSTIT is a change in institutional ownership for the year after the analysts’ earnings forecasts disclosed at the beginning of the year. VRIVC and VRIVI are the equity value estimates inferred from analysts’ earnings forecasts from the RIVC and RIVI model at the beginning of the year respectively. See the main text for the details of the implementation of each valuation model. P is the stock price at the end of December each year. \( V_{\text{AVER}} \) is the average amount of previous two equity value estimates above. TARGET is the analysts’ target price (discounted for 6 months) divided by the stock price. RECOM is the analysts’ stock recommendation, ranging from 1 to 5 (1 = Strong Sell, 2 = Sell, 3 = Hold, 4 = Buy, and 5 = Strong Buy). SIZE is market value of equity at the beginning of year (Billion Korean Won). BETA is the systematic risk estimated by regressing at least 30 prior monthly stock returns up to 60 prior monthly returns against the corresponding market index. IDRISK is the idiosyncratic risk, which is measured as the variance of residuals from the regressions of BETA estimation. OIVOL is the standard deviation of operating income during at least past two years up to five years, scaled by average total asset. B/M is the book value of equity divided by market value of equity. D/M is the book value of debt divided by market value of equity. YIELD is the dividend per share divided by stock price at the beginning of year. LEVERAGE is total liability divided by total asset. VOLUME is the average of the ratio of daily trading volume, divided by the number of shares outstanding. IRET12 is the stock return of each firm for the previous year. Although I use the logarithmic values of SIZE, B/M and D/M in subsequent main analyses, I present the distributions of the raw values of these variables for a descriptive purpose.

| Variables | MEAN | Std. Dev. | 5% | 10% | 25% | MEDIAN | 75% | 90% | 95% | No. of Observations |
|-----------|------|-----------|----|-----|-----|--------|-----|-----|-----|---------------------|
| RET12     | 0.255| 0.521     | -0.456| -0.332| -0.107| 0.132 | 0.508| 1.023| 1.480| 1,421               |
| ΔINSTIT   | 0.005| 0.068     | -0.123| -0.087| -0.037| 0.002 | 0.046| 0.098| 0.138| 1,421               |
| \( V_{\text{RIVC/P}} \) | 1.571| 0.849     | 0.521| 0.635| 0.911| 1.350 | 2.040| 2.914| 3.554| 1,421               |
| \( V_{\text{RIVI/P}} \) | 2.113| 1.628     | 0.499| 0.641| 0.954| 1.556 | 2.662| 4.809| 6.440| 1,421               |
| \( V_{\text{AVER/P}} \) | 1.854| 1.202     | 0.527| 0.652| 0.966| 1.470 | 2.331| 3.862| 4.865| 1,421               |
| TARGET    | 1.209| 0.195     | 0.907| 0.965| 1.063| 1.185 | 1.322| 1.490| 1.617| 1,421               |
| RECOM     | 3.701| 0.320     | 3.000| 3.170| 3.500| 3.800 | 4.000| 4.000| 4.000| 1,421               |
| SIZE      | 1.915| 3.091     | 45  | 67  | 161 | 477    | 2,010| 6,232| 11,580| 1,421               |
| BETA      | 0.982| 0.354     | 0.369| 0.507| 0.728| 0.953 | 1.221| 1.509| 1.672| 1,421               |
| IDRISK    | 0.018| 0.011     | 0.005| 0.007| 0.010| 0.015  | 0.023| 0.036| 0.046| 1,421               |
| OIVOL     | 0.028| 0.019     | 0.005| 0.008| 0.013| 0.023  | 0.037| 0.058| 0.072| 1,421               |
| B/M       | 1.251| 0.902     | 0.270| 0.366| 0.572| 0.964  | 1.637| 2.765| 3.521| 1,421               |
| D/M       | 1.259| 1.335     | 0.112| 0.168| 0.335| 0.710  | 1.647| 3.446| 4.946| 1,421               |
| YIELD     | 0.020| 0.016     | 0.000| 0.001| 0.008| 0.016  | 0.029| 0.045| 0.058| 1,421               |
| LEVERAGE  | 0.439| 0.171     | 0.147| 0.186| 0.303| 0.451  | 0.575| 0.669| 0.718| 1,421               |
| VOLUME    | 0.008| 0.006     | 0.001| 0.002| 0.003| 0.007  | 0.011| 0.018| 0.024| 1,421               |
| IRET12    | 0.413| 0.645     | -0.416| -0.259| -0.043| 0.256 | 0.744| 1.449| 1.947| 1,421               |
Table 2. Pair-wise Correlations between Key Variables

This table presents Pearson correlations between key variables for the pooled sample. Please see note of Table 1 for the definitions of variables except followings. \( \text{lnSIZE} \) is the natural log of the market value of equity. \( \lnB/M \) is the natural log of book value of equity divided by market value of equity. \( \lnD/M \) is the natural log of book value of debt divided by market value of equity. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.

|          | RET12 | ΔINSTIT | V_RIVC/P | V_RIVI/P | V_AVER/P | TARGET | RECOM | lnSIZE |
|----------|-------|---------|----------|----------|----------|--------|-------|--------|
| ΔINSTIT  | 0.280*** |         |          |          |          |        |       |        |
| V_RIVC/P | 0.299*** | 0.166*** |          |          |          |        |       |        |
| V_RIVI/P | 0.228*** | 0.125*** | 0.786*** |          |          |        |       |        |
| V_AVER/P | 0.264*** | 0.144*** | 0.900*** | 0.971*** |          |        |       |        |
| TARGET   | 0.020  | 0.074*** | 0.270*** | 0.093*** | 0.162*** |        |       |        |
| RECOM    | -0.087*** | -0.026  | -0.029  | -0.122*** | -0.094*** | 0.309*** |       |        |
| SIZE     | 0.135*** | -0.092*** | -0.397*** | -0.327*** | -0.371*** | -0.206*** | 0.165*** |        |
| BETA     | -0.022  | -0.060** | -0.390*** | -0.394*** | -0.412*** | 0.075*** | 0.113*** | 0.109*** |
| IDRISK   | 0.074*** | 0.124*** | 0.116*** | 0.032  | 0.066** | 0.138*** | -0.126*** | -0.308*** |
| OIVOL    | 0.033  | 0.058** | -0.046** | -0.050* | -0.054** | 0.050*  | 0.094*** | 0.065*** |
| B/M      | -0.258*** | 0.030  | 0.407*** | 0.377*** | 0.406*** | 0.176*** | -0.217*** | -0.581*** |
| D/M      | -0.097*** | 0.050  | 0.302*** | 0.245*** | 0.279*** | 0.176*** | -0.176*** | -0.323*** |
| YIELD    | -0.121*** | 0.093*** | 0.303*** | 0.235*** | 0.274*** | 0.071*** | -0.102*** | -0.268*** |
| LEVERAGE | 0.101*** | -0.025  | 0.032  | -0.018  | 0.002  | 0.067** | -0.051*  | 0.089*** |
| VOLUME   | 0.037  | 0.130*** | -0.006  | -0.091*** | -0.061** | 0.143*** | -0.055** | -0.170*** |
| lRET12   | -0.138*** | -0.024  | -0.153*** | -0.090*** | -0.120*** | -0.197*** | 0.280*** | 0.097*** |

No. of Observations | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 |
|       | BETA | IDRISK | OIVOL | B/M | D/M | YIELD | LEVERAGE | VOLUME |
|-------|------|--------|-------|-----|-----|-------|----------|--------|
| IDRISK| 0.272*** |        |       |     |     |       |          |        |
| OIVOL | 0.119*** | 0.124*** |       |     |     |       |          |        |
| B/M   | -0.044*  | 0.144*** | -0.270*** |     |     |       |          |        |
| D/M   | 0.156*** | 0.272*** | -0.298*** | 0.684*** |     |       |          |        |
| YIELD | -0.196*** | 0.032 | -0.136*** | 0.412*** | 0.243*** |     |          |        |
| LEVERAGE | 0.265*** | 0.240*** | -0.172*** | 0.036 | 0.730*** | -0.053** |          |        |
| VOLUME | 0.344*** | 0.405*** | 0.142*** | 0.045* | 0.137*** | 0.074*** | 0.149*** |        |
| IRET12 | 0.144*** | 0.086*** | 0.181*** | -0.210*** | -0.074*** | -0.131*** | 0.091*** | 0.139*** |
| No. of Observations | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 | 1,421 |
4.2 Multivariate Analysis

4.2.1 The association between institutional investors and sell side analysts

Cha and Yoo (2010) find that the sell side analysts’ forecast information is associated with the future stock return. The results imply that the overall analysts’ forecast information provides useful information to the stock market participants, and can predict the future stock return. However, sell-side analysts cannot accelerate stock price convergence toward intrinsic value of equity by themselves. Therefore, there must be some stock market participants. Thus, table 3 examines whether institutional investors use the sell side analysts’ forecast information more actively than individual investors and buy stocks when sell side analysts’ information is favorable. Panel A of table 3 shows that the coefficients on the level of $V_{RIVC}/P$, $V_{RIVI}/P$, $VAVER/P$, TARGET, and RECOM are positively associated with the change of the institutional ownership.

Furthermore, I investigate whether the sophisticated institutional investors use earnings forecast information (V/P ratio) to analyze the whole valuation process in addition to incorporating explicit recommendation, target price. From panel B of table 3 I find that the change of institutional investor’s ownership during the year has a significantly positive association with the level of equity value estimates based on sell-side analysts’ earnings forecasts relative to stock prices, in addition to recommendation at the beginning of the year. Also, panel B of table 3 shows that the coefficients of target price is insignificant, meaning that even though target price itself has useful information, it does not provide any additional information in addition to V/P ratios, recommendation.

In sum, this result indicates that institutional investors increase their shares of equity for the firms for which analysts issue favorable information via their V/P ratios.
with recommendation more actively than individual investors, meaning that institutional investors may take an active role as a mechanism to incorporate V/P ratios (value to price) derived from earnings forecast information to analyze the whole valuation process, in addition to using the outputs as Recommendation.
Table 3. Regressions of Sell-side Analysts’ information on Institutional Ownership

This table presents the pooled sample regressions of a change in institutional ownership on the equity value estimates inferred from analysts’ earnings forecasts scaled by stock prices, target prices scaled by stock prices, and stock recommendations with control variables. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

(Panel A)

< Equation 1 ~ 3 > \( \Delta INSTIT = \beta_0 + \beta_1 V_{RIVC}/P (V_{RIVI}/P, V_{AVER}/P) + \beta_2 \ln SIZE + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln B/M + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \)

\[ + \beta_8 \text{Lag}(\text{Ret12}) + \text{Year Dummies} + \text{Industry Dummies} + \epsilon \]

< Equation 4 > \( \Delta INSTIT = \beta_0 + \beta_1 \text{TARGET} + \beta_2 \ln SIZE + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln B/M + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \)

\[ + \beta_8 \text{Lag}(\text{Ret12}) + \text{Year Dummies} + \text{Industry Dummies} + \epsilon \]

< Equation 5 > \( \Delta INSTIT = \beta_0 + \beta_1 \text{RECOM} + \beta_2 \ln SIZE + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln B/M + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \)

\[ + \beta_8 \text{Lag}(\text{Ret12}) + \text{Year Dummies} + \text{Industry Dummies} + \epsilon \]

(Panel B)

< Equation 6 ~ 8 > \( \Delta INSTIT = \beta_0 + \beta_1 V_{RIVC}/P (V_{RIVI}/P, V_{AVER}/P) + \beta_2 \text{TARGET} + \beta_3 \text{RECOM} + \beta_4 \ln SIZE + \beta_5 \text{YIELD} + \beta_6 \text{BETA} + \beta_7 \ln B/M \)

\[ + \beta_8 \text{LEVERAGE} + \beta_9 \text{VOLUME} + \beta_{10} \text{Lag}(\text{Ret12}) + \text{Year Dummies} + \text{Industry Dummies} + \epsilon \]

Adj. R\(^2\) is the adjusted R\(^2\) for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
| Variables     | (1) Coef. | t stat. | (2) Coef. | t stat. | (3) Coef. | t stat. | (4) Coef. | t stat. | (5) Coef. | t stat. |
|---------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| Intercept     | -0.014    | -0.35   | 0.018     | 0.46    | 0.026     | 0.70    | 0.001     | 0.03    | -0.021    | -0.50   |
| \(V_{RIVC/P}\) | 0.012     | ***     | 4.11      |         |           |         |           |         |           |         |
| \(V_{RIVI/P}\) | 0.004     | ***     | 2.74      |         |           |         |           |         |           |         |
| \(V_{AVER/P}\) |          |         |           |         | 0.002     | **      | 2.40      |         |           |         |
| TARGET        |           |         |           |         |           |         | 0.024     | **      | 2.40      |         |
| RECOM         |           |         |           |         |           |         |           |         | 0.018     | ***     | 3.01    |
| InSIZE        | 0.000     | 0.05    | -0.000    | -0.53   | -0.000    | -0.60   | -0.000    | -0.48   | -0.001    | -0.93   |
| YIELD         | 0.061     | 0.49    | 0.106     | 0.86    | 0.117     | 0.95    | 0.106     | 0.86    | 0.085     | 0.69    |
| BETA          | 0.006     | 1.06    | 0.003     | 0.54    | -0.000    | -0.11   | -0.004    | -0.77   | -0.004    | -0.79   |
| InB/M         | -0.015    | ***     | -4.18     |         | -0.014    | ***     | -3.98     |         | -0.013    | ***     | -3.66   |
| LEVERAGE      | -0.015    | -1.41   | -0.012    | -1.09   | -0.009    | -0.87   | -0.010    | -0.92   | -0.005    | -0.53   |
| VOLUME        | 0.683     | **      | 2.17      |         | 0.730     | **      | 2.31      |         | 0.733     | **      | 2.32    |
| Lag(Ret12)    | -0.002    | -0.83   | -0.002    | -0.67   | -0.002    | -0.70   | -0.001    | -0.31   | -0.004    | -1.30   |

Industry Dummies: Included, Year Dummies: Included, Adj. R²: 0.166, N.: 1,421
Table 3. Regressions of Sell-side Analysts’ information on Institutional Ownership (Continued)

(Panel B)

| Variables       | Coef.    | t stat. | Coef.    | t stat. | Coef.    | t stat. |
|-----------------|----------|---------|----------|---------|----------|---------|
| Intercept       | -0.052   | -1.18   | -0.050   | -1.11   | -0.047   | -1.06   |
| $V_{RIVC}/P$    | 0.010 ***| 3.14    |          |         |          |         |
| $V_{RIVI}/P$    |          |         | 0.003 ** | 2.30    |          |         |
| $V_{AVER}/P$    |          |         |          |         | 0.002 ** | 2.13    |
| $\Delta \text{INSTIT}$ |          |         |          |         |          |         |
| $\Delta \text{VRIVC}/P$ |          |         |          |         |          |         |
| $\Delta \text{VRIVI}/P$ |          |         |          |         |          |         |
| $\Delta \text{VAVER}/P$ |          |         |          |         |          |         |
| $\Delta \text{TARGET}$ |          |         |          |         |          |         |
| $\Delta \text{RECOM}$ |          |         |          |         |          |         |
| $\Delta \text{lnSIZE}$ |          |         |          |         |          |         |
| $\Delta \text{YIELD}$ |          |         |          |         |          |         |
| $\Delta \text{BETA}$ |          |         |          |         |          |         |
| $\Delta \text{lnB/M}$ |          |         |          |         |          |         |
| $\Delta \text{LEVERAGE}$ |          |         |          |         |          |         |
| $\Delta \text{VOLUME}$ |          |         |          |         |          |         |
| $\Delta \text{Lag(Ret12)}$ |          |         |          |         |          |         |
| Industry Dummies | Included |         | Included |         | Included |         |
| Year Dummies | Included |         | Included |         | Included |         |
| Adj. $R^2$ | 0.168 |         | 0.166 |         | 0.165 |         |
| N. | 1,421 |         | 1,421 |         | 1,421 |         |
4.2.2 The impact of accuracy of sell side analysts’ earnings forecast on the interaction between institutional investors and sell side analysts

To test 2nd hypothesis, I examine whether institutional investors can differentiate good information from bad information provided by sell-side analysts. I examine whether institutional investors incorporate sell-side analysts’ forecast information only when the earnings forecast information is more accurate. I define the less (more) accurate analysts’ earnings forecast if analysts’ earnings forecast error is less than (over) the median value of analysts’ earnings forecast error (0.029).

Panel A of table 4 shows that when analysts’ earnings forecast error is higher than the median value (0.029), the coefficients on the \( VRIVC/P \), \( VRIVI/P \), \( VAVER/P \), and \( TARGET \) are not significant, and only \( RECOM \) is weakly significant at 10% significance level. It implies that institutional investors do not use sell-side analysts’ information if the earnings forecast are less accurate.

On the other hand, Panel B of table 4 shows that when analysts’ earnings forecast error is lower than the median value (0.029), the coefficients on the \( VRIVC/P \), \( VRIVI/P \), \( VAVER/P \), and \( RECOM \) are significantly positive. Therefore, institutional investors are more likely to incorporate the analysts’ V/P ratio information and recommendation only when analysts’ earnings forecast are more accurate. It implies that institutional investors can differentiate the good information from bad information provided sell-side analysts.
Table 4. Regressions of Sell-side Analysts’ information on Institutional Ownership  
(by Accuracy of Analysts’ earnings forecast)

This table presents the pooled sample regressions of a change in institutional ownership on the equity value estimates inferred from analysts’ earnings forecasts scaled by stock prices, target prices, and stock recommendations with control variables by the accuracy of analysts’ earnings forecast. I divide the total sample into two groups by the analysts’ earnings forecast error. I define the more (less) accurate information if the analysts’ earnings forecast error is less than (over) the median value of analysts’ earnings forecast error. The median value of analysts’ earnings forecast error is 0.029. The analysts’ earnings forecast error is defined as the absolute value of the difference between the estimated earnings per share and the realized earnings per share divided by price at the end of the year. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

(Panel A and B)

\[ \Delta \text{INSTIT} = \beta_0 + \beta_1 \frac{\text{VRIVC}}{\text{P}} (\frac{\text{VRIVI}}{\text{P}}, \frac{\text{VAVER}}{\text{P}}) + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \]
\[ + \beta_8 \text{Lag(Ret12)} + \text{Year Dummies} + \text{Industry Dummies} + \varepsilon \]

\[ \Delta \text{INSTIT} = \beta_0 + \beta_1 \text{TARGET} + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \]
\[ + \beta_8 \text{Lag(Ret12)} + \text{Year Dummies} + \text{Industry Dummies} + \varepsilon \]

\[ \Delta \text{INSTIT} = \beta_0 + \beta_1 \text{RECOM} + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \]
\[ + \beta_8 \text{Lag(Ret12)} + \text{Year Dummies} + \text{Industry Dummies} + \varepsilon \]

Adj. $R^2$ is the adjusted $R^2$ for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
## Analysts’ Earnings Forecast Error > Median Value (0.029)

**Dependent Variable = ΔINST1T**

| Variables | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. |
|-----------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
| Intercept | -0.031| -0.46   | -0.013| -0.20   | -0.018| -0.28   | -0.048| -0.68   | -0.061| -0.84   |
| VRIVC/P   | 0.005 | 1.30    | 0.001 | 0.62    | 0.002 | 1.25    |
| VRIVI/P   |       |         |       |         |       |         |
| VAVER/P   |       |         |       |         |       |         |
| TARGET    | 0.021 | 1.53    |       |         |       |         |
| RECOM     |       |         |       |         |       |         |
| lnSIZE    | 0.000 | 0.12    | -0.000| -0.06   | -0.000| -0.01   | 0.000 | 0.08    | -0.000| -0.19   |
| YIELD     | -0.065| -0.38   | -0.051| -0.29   | -0.050| -0.29   | -0.045| -0.26   | -0.074| -0.43   |
| BETA      | 0.003 | 0.32    | 0.000 | 0.08    | 0.001 | 0.12    | -0.002| -0.22   | -0.001| -0.15   |
| lnB/M     | -0.023| **-4.04**| -0.023| **-3.96**| -0.023| **-4.01**| -0.022| **-3.87**| -0.021| **-3.76**|
| LEVERAGE  | -0.004| -0.23   | -0.003| -0.16   | -0.003| -0.17   | -0.003| -0.18   | 0.001 | 0.06    |
| VOLUME    | 0.668 | 1.46    | 0.692 | 1.52    | 0.690 | 1.51    | 0.651 | 1.43    | 0.756 | *1.65   |
| Lag(Ret12)| -0.008| *-1.70   | -0.008| *-1.70   | -0.008| *-1.72   | -0.007| -1.49   | -0.010| **-2.07**|

**Industry Dummies** Included  Included  Included  Included  Included

**Year Dummies** Included  Included  Included  Included  Included

**Adj. R²** 0.217  0.216  0.217  0.218  0.219

**N.** 711  711  711  711  711
### Analysts’ Earnings Forecast Error < Median Value (0.029)

Dependent Variable = $\Delta \text{INSTIT}$

| Variables      | (1)          | (2)          | (3)          | (4)          | (5)          |
|----------------|--------------|--------------|--------------|--------------|--------------|
|                | Coef.  | t stat. | Coef.  | t stat. | Coef.  | t stat. | Coef.  | t stat. | Coef.  | t stat. |
| Intercept      | -0.008  | -0.12   | 0.046  | 0.74    | -0.010  | -0.82   | 0.083  | 1.24    | 0.026  | 0.39    |
| $VRIVC/P$      | 0.018 *** | 3.67    |         |         |         |         |         |         |         |         |
| $VRIVI/P$      | 0.007 *** | 2.90    |         |         |         |         |         |         |         |         |
| $VAVER/P$      | 0.003 * | 1.78    |         |         |         |         |         |         |         |         |
| TARGET         | 0.008   | 0.50    |         |         |         |         |         |         |         |         |
| RECOM          | 0.021 **| 2.27    |         |         |         |         |         |         |         |         |
| $lnSIZE$       | -0.001  | -0.72   | -0.003 | -1.49   | -0.000  | -0.42   | -0.004 *| -1.87   | -0.004 **| -2.12   |
| $YIELD$        | 0.248   | 1.14    | 0.340  | 1.55    | 0.315   | 1.63    | 0.268  | 1.21    | 0.231  | 1.05    |
| $BETA$         | 0.011   | 1.15    | 0.007  | 0.80    | -0.002  | -0.26   | -0.003  | -0.42   | -0.004  | -0.53   |
| $lnB/M$        | -0.013 **| -2.32   | -0.014 **| -2.39 | -0.006 | -1.29 | -0.008 | -1.50 | -0.007 | -1.22 |
| LEVERAGE       | -0.024 | -1.30   | -0.021 | -1.13   | -0.013 | -0.87   | -0.015 | -0.83   | -0.015 | -0.82   |
| $VOLUME$       | 1.221 **| 2.34    | 1.238 **| 2.36 | 1.244 ***| 2.62 | 1.192 **| 2.25 | 1.272 **| 2.42 |
| Lag(Ret12)     | -0.001 | -0.26   | -0.000 | -0.03   | 0.000   | 0.06    | 0.000 | 0.08    | -0.002 | -0.51   |

Industry Dummies: Included  
Year Dummies: Included  
Adj. R$^2$: 0.213  
N: 710
4.2.3 The impact of institutional ownership change on a change in sell side analysts’ information

This paper examines the interaction between the institutional investors and the sell side analysts’ information. So far, I find that the institutional investors use the sell-side analysts’ forecast information. In this section, I examine if the institutional investors affect the sell-side analysts information through the trading commission fee. Therefore, I examine whether a change in institutional investors’ ownership affect the change of sell side analysts’ opinion.

Table 5 is the result of the impact of a change in institutional ownership on a change in the sell-side analysts’ forecast information. The coefficients of a change in institutional ownership each equation are -0.250, -0.269, 1.367, -0.197, and 0.052 but insignificant. It means that sell-side analysts do not use information produced by buy-side investors’ trading behavior.

In sum, by examining the interaction between institutional investors and sell side analysts on both sides, I can conclude that the main results support the causality relationship that institutional investors trade by looking at the sell-side analysts’ valuation process in detail, and by using their information only when the earnings forecast information is more accurate, not the other way round.
Table 5. Regressions of the change in Institutional Ownership on the change in the Sell-side Analysts’ information

This table presents the pooled sample regressions of a change in the equity value estimates inferred from analysts’ earnings forecasts scaled by stock prices, target prices, and stock recommendations on institutional ownership change of the previous year with control variables. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

< Equation 9 ~ 11 > \[ \Delta VRIVC/P (\Delta VRIVI/P, \Delta VAVER/P) = \beta_0 + \beta_1 \text{Lag}(\Delta \text{INSTIT}) + \beta_2 \text{lnSIZE} + \beta_3 \text{BETA} + \beta_4 \text{IDRISK} + \beta_5 \text{OIVOL} + \beta_6 \text{lnB/M} + \beta_7 \text{lnD/M} \]
+ Year Dummies + Industry Dummies + \varepsilon

< Equation 12 > \[ \Delta \text{TARGET}/P = \beta_0 + \beta_1 \text{Lag}(\Delta \text{INSTIT}) + \beta_2 \text{lnSIZE} + \beta_3 \text{BETA} + \beta_4 \text{IDRISK} + \beta_5 \text{OIVOL} + \beta_6 \text{lnB/M} + \beta_7 \text{lnD/M} \]
+ Year Dummies + Industry Dummies + \varepsilon

< Equation 13 > \[ \Delta \text{RECOM} = \beta_0 + \beta_1 \text{Lag}(\Delta \text{INSTIT}) + \beta_2 \text{lnSIZE} + \beta_3 \text{BETA} + \beta_4 \text{IDRISK} + \beta_5 \text{OIVOL} + \beta_6 \text{lnB/M} + \beta_7 \text{lnD/M} \]
+ Year Dummies + Industry Dummies + \varepsilon

Adj. R² is the adjusted R² for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
| Variables         | (1) $\Delta V_{RIVC}/P$ | Coef.  | t stat. | (2) $\Delta V_{RIVI}/P$ | Coef.  | t stat. | (3) $\Delta V_{AVER}/P$ | Coef.  | t stat. | (4) $\Delta TARGET/P$ | Coef.  | t stat. | (5) $\Delta RECOM$ | Coef.  | t stat. |
|-------------------|--------------------------|--------|---------|--------------------------|--------|---------|--------------------------|--------|---------|--------------------------|--------|---------|----------------------|--------|---------|
| Intercept         |                         | -1.729 | ***     | -0.323                   |         | -0.65   | -4.885                   | ***     | -3.24   | -6.113                   | ***     | -6.53   | 0.070                | 0.91   |         |
| Lag(ΔINSTIT)      |                         | -0.250 | -1.16   | -0.269                   | -0.86   | 1.367   | 1.32                    |         | -0.197  | -0.33                    |         | 0.052   | 0.99     |         |         |
| lnSIZE            |                         | 0.081  | ***     | 0.051                    | ***     | 2.98    | 0.208                   | ***     | 3.99    | 0.218                   | ***     | 6.74    | -0.002   | -0.83   |         |
| BETA              |                         | -0.344 | ***     | -0.589                   | ***     | -7.93   | -0.671                   | ***     | -2.91   | -0.195                   | -1.39   | 0.000   | 0.05     |         |         |
| IDRISK            |                         | 2.154  | 1.18    | 1.373                    | 0.52    | 11.952  | 1.40                    | 5.094   | 1.03    | 0.722                   | *       | 1.66    |          |         |         |
| OIVOL             |                         | 1.627  | *       | 1.87                     | -0.152  | -0.12   | -4.235                   | -1.06   | 0.358   | 0.15                     | 0.201   | 0.99    |          |         |         |
| lnB/M             |                         | 0.114  | ***     | 3.87                     | 0.088   | **      | 2.07                    | 0.130   | 0.98    | 0.122                   | 1.52    | 0.002   | 0.42     |         |         |
| lnD/M             |                         | 0.004  | 0.28    | 0.010                    | 0.44    | 0.009   | 0.13                    | 0.024   | 0.55    | 0.001                   | 0.35    |          |          |         |         |
| Industry Dummies  | Included                |         |         |                          |         |         |                          |         |         |                          |         |         |          |         |         |
| Year Dummies      | Included                |         |         |                          |         |         |                          |         |         |                          |         |         |          |         |         |
| Adj. R²           | 0.264                   |         |         |                          | 0.430   |         |                          | 0.077   |         |                          | 0.180   |         | 0.074    |         |         |
| N.                | 1,365                   |         |         |                          | 1,365   |         |                          | 1,365   |         |                          | 1,365   |         | 1,365    |         |         |
V. SENSITIVITY TEST

5.1 Full sample (2001-2011) including year 2008

In the main analysis I use sample data from 2001 to 2011, but exclude year 2008 to mitigate possible effect of the global financial crisis on the behavior of sell side analysts. In this sensitivity test, I include year 2008 to examine if main result maintains even after including year 2008. The total sample is 1,589 firm-year observations. Panel A of Table 6 shows that the coefficients on $V_{RIVC}/P$, $V_{RIVI}/P$, $TARGET$, and $RECOM$ are positively associated with the change of the institutional ownership. It means that if the V/P ratio is relatively high and the analysts’ forecast information ($TARGET$ and $RECOM$) is more favorable, the institutional investors increase their ownership. Therefore, the main result remains constant in a sense that the institutional investors incorporate more actively the useful sell side analysts’ forecast information even after including 2008 year under the global financial crisis.
Table 6. Regressions of Sell-side Analysts’ information on Institutional Ownership (Full Sample including 2008)

This table presents the pooled sample regressions of a change in institutional ownership on the equity value estimates inferred from analysts’ earnings forecasts scaled by stock prices, target prices scaled by stock prices, and stock recommendations with control variables. I use full sample including year 2008. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

(Panel A)

< Equation 1 ~ 3 > \( \Delta \text{INSTIT} = \beta_0 + \beta_1 \frac{V_{RIVC}}{P} (V_{RIVF}/P, V_{AVER}/P) + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \) 
\[ + \beta_8 \text{Lag(Ret12)} \text{+ Year Dummies + Industry Dummies + } \varepsilon \]

< Equation 4 > \( \Delta \text{INSTIT} = \beta_0 + \beta_1 \text{TARGET} + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \) 
\[ + \beta_8 \text{Lag(Ret12)} \text{+ Year Dummies + Industry Dummies + } \varepsilon \]

< Equation 5 > \( \Delta \text{INSTIT} = \beta_0 + \beta_1 \text{RECOM} + \beta_2 \ln \text{SIZE} + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln \text{B/M} + \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} \) 
\[ + \beta_8 \text{Lag(Ret12)} \text{+ Year Dummies + Industry Dummies + } \varepsilon \]

(Panel B)

< Equation 6 ~ 8 > \( \Delta \text{INSTIT} = \beta_0 + \beta_1 \frac{V_{RIVC}}{P} (V_{RIVF}/P, V_{AVER}/P) + \beta_2 \text{TARGET} + \beta_3 \text{RECOM} + \beta_4 \ln \text{SIZE} + \beta_5 \text{YIELD} + \beta_6 \text{BETA} + \beta_7 \ln \text{B/M} \) 
\[ + \beta_8 \text{LEVERAGE} + \beta_9 \text{VOLUME} + \beta_{10} \text{Lag(Ret12)} \text{+ Year Dummies + Industry Dummies + } \varepsilon \]

Adj. \( R^2 \) is the adjusted \( R^2 \) for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
(Panel A) Dependent Variable = ΔINSTIT

| Variables          | (1)       |          | (2)       |          | (3)       |          | (4)       |          | (5)       |          |
|--------------------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|
|                    | Coef.     | t stat.  | Coef.     | t stat.  | Coef.     | t stat.  | Coef.     | t stat.  | Coef.     | t stat.  |
| Intercept          | -0.046    | -1.23    | -0.014    | -0.40    | -0.006    | -0.16    | -0.047    | -1.19    | -0.067    | -1.62    |
| $V_{RIVC/P}$       | 0.009 *** | 3.65     | 0.003 **  | 2.10     | 0.001     | 1.62     | 0.028 *** | 2.97     | 0.019 *** | 3.34     |
| $V_{RIVI/P}$       |           |          |           |          |           |          |           |          |           |          |
| $V_{AVG/P}$        |           |          |           |          |           |          |           |          |           |          |
| TARGET             |           |          |           |          |           |          |           |          |           |          |
| $V_{AVG/P}$        |           |          |           |          |           |          |           |          |           |          |
| $\text{RECOM}$    |           |          |           |          |           |          | 0.019 *** | 3.34     |           |          |
| $\ln\text{SIZE}$ | 0.001     | 1.15     | 0.000     | 0.54     | 0.000     | 0.44     | 0.001     | 0.79     | 0.000     | 0.25     |
| $\text{YIELD}$    | 0.044     | 0.37     | 0.084     | 0.70     | 0.089     | 0.74     | 0.079     | 0.66     | 0.061     | 0.50     |
| $\text{BETA}$     | 0.000     | 0.15     | -0.002    | -0.35    | -0.005    | -0.92    | -0.008    | -1.48    | -0.007    | -1.39    |
| $\ln\text{B/M}$  | -0.013 ***| -4.02    | -0.013 ***| -3.79    | -0.012 ***| -3.53    | -0.011 ***| -3.31    | -0.010 ***| -3.07    |
| LEVERAGE           | -0.016    | -1.52    | -0.012    | -1.20    | -0.011    | -1.04    | -0.012    | -1.14    | -0.007    | -0.74    |
| $\text{VOLUME}$   | 0.931 *** | 3.04     | 0.982 *** | 3.20     | 0.986 *** | 3.21     | 0.894 *** | 2.91     | 1.035 *** | 3.37     |
| $\text{Lag(Ret12)}$ | -0.002    | -0.78    | -0.002    | -0.68    | -0.002    | -0.72    | -0.001    | -0.33    | -0.004    | -1.46    |
| Industry Dummies  | Included  |          | Included  |          | Included  |          | Included  |          | Included  |          |
| Year Dummies       | Included  |          | Included  |          | Included  |          | Included  |          | Included  |          |
| Adj. $R^2$         | 0.163     |          | 0.158     |          | 0.157     |          | 0.160     |          | 0.162     |          |
| N.                 | 1,589     |          | 1,589     |          | 1,589     |          | 1,589     |          | 1,589     |          |
Table 6. Regressions of Sell-side Analysts’ information on Institutional Ownership (Full Sample including 2008) (Continued)

(Panel B)

| Variables     | Coef.    | t stat. | Coef. | t stat. | Coef. | t stat. |
|---------------|----------|---------|-------|---------|-------|---------|
| Intercept     | -0.097   | **      | -2.27 | -0.0932 | **   | -2.17   | -0.091 | **      | -2.12   |
| VRIVC /P      | 0.007    | **      | 2.36  |         |       |         |         |         |         |
| VRIVI /P      |          |         |       | 0.0021  | 1.47  |         | 0.001  | 1.25    |
| VAVER/P       |          |         |       |         |       |         |         |         |         |
| TARGET        | 0.010    | 0.90    |       | 0.0156  | 1.45  | 0.016   | 1.56   |
| RECOM         | 0.012    | *       | 1.93  | 0.0146  | **   | 2.29    | 0.015  | **      | 2.36    |
| lnSIZE        | 0.001    | 1.09    |       | 0.0010  | 0.77  | 0.001   | 0.73   |
| YIELD         | 0.034    | 0.28    |       | 0.0574  | 0.47  | 0.058   | 0.48   |
| BETA          | -0.002   | -0.39   |       | -0.0048 | -0.81 | -0.006  | -1.25  |
| lnB/M         | -0.012   | ***     | -3.61 | -0.0122 | ***  | -3.43   | -0.011 | ***     | -3.29   |
| LEVERAGE      | -0.014   | -1.29   |       | -0.0118 | -1.09 | -0.010  | -0.99  |
| VOLUME        | 0.956    | ***     | 3.10  | 0.9854  | ***  | 3.19    | 0.986  | ***     | 3.19    |
| Lag(Ret12)    | -0.003   | -1.12   |       | -0.0038 | -1.08 | -0.003  | -1.12  |

Industry Dummies | Included | Included | Included |
Year Dummies     | Included | Included | Included |
Adj. R²          | 0.166    | 0.164    | 0.164    |
N                | 1,589    | 1,589    | 1,589    |

Note: ** denotes significance at the 0.01 level, * denotes significance at the 0.05 level.
5.2 $EPS/P, V_{OJ}/P, V_{PEG}/P$ as sell side analysts’ information

In the main analysis, I use the equity value estimates inferred from analysts’ earnings forecasts from the $RIVC$ and $RIVI$ model because they are more accurate valuation model according to Jorgensen et al. (2011). In the sensitivity test, I examine if the result of main analysis remains unchanged even though I employ the equity value estimates inferred from analysts’ earnings forecasts from the OJ and PEG model.

Following Gode and Mohanram (2003), the OJ model calculates equity value estimates using only earnings forecast without considering book value of equity.

\[ V_{OJ} = \frac{\text{eps}_{r+1}}{r_i} + \frac{E_i(\text{eps}_{r+2} - r_i\text{dps}_{r+1} - (1 + r_i)\text{eps}_{r+1})}{r_i \times (r_i - \gamma + 1)} \]

\[ \gamma - 1 = \text{Risk free rate minus core inflation following Gode and Mohanram (2003); and} \]
\[ \text{dps}_{r+1} = \text{Divided per share during year t} \]

The PEG valuation model simplifies the OJ model with assumption of \( \gamma = 1 \) and \( \text{dps}_{r+1} = 0 \) (Easton 2004).

\[ V_{PEG} = \frac{\text{eps}_{r+2} - \text{eps}_{r+1}}{r_i^2} \]

\( \text{eps}_{r+1} = \) one year ahead earnings per share; and
\( \text{eps}_{r+2} = \) two year ahead earnings per share

Furthermore, I use one year and two year ahead earnings per share ($EPS1/P$, $EPS2/P$), and industry median adjusted one year and two year ahead earnings per share ($EPS1_{indu}/P$, $EPS2_{indu}/P$) because earnings per share reported on sell-side analysts’ reports are the key variables to estimate the equity value inferred from analysts’ earnings forecasts through valuation model.
Panel A of table 7 shows that the coefficients on $EPS1/P$, $EPS2/P$, $EPS1\_indu/P$, $EPS2\_indu/P$, $VOJ/P$, and $VPEG/P$ are significantly positively associated with the change of institutional ownership. I find that even though I replace the $VRIVC/P$, $VRIVI/P$ with $VOJ/P$, $VPEG/P$, and use $EPS1/P$, $EPS2/P$, $EPS1\_indu/P$, and $EPS2\_indu/P$ reported on sell side analysts’ report, the result of main analysis remains constant. Therefore, I conclude that the institutional investors take action more actively than individual investors using sell side analysts’ forecasted earnings per share itself and V/P ratio derived from OJ and PEG valuation model. Furthermore, from panel B of table 7, I find that the coefficients on $EPS2/P$, $EPS2\_indu/P$, $VOJ/P$, $VPEG/P$, and $RECOM$ are significantly positively associated with the change of institutional ownership. It means that sell-side analysts’ two year ahead earnings forecast and V/P ratio derived from OJ and PEG model provide additional information to the institutional investors.
Table 7. Regressions of Sell-side Analysts’ information on Institutional Ownership (E/P, Voj/P, Vpeg/P)

This table presents the pooled sample regressions of a change in institutional ownership on the equity value estimates inferred from analysts’ earnings forecasts derived from OJ and PEG model scaled by stock prices, one-year ahead earnings per share scaled by stock prices, two-year ahead earnings per share scaled by stock prices, one-year ahead earnings per share adjusted by industry median scaled by stock prices, and two-year ahead earnings per share adjusted by industry median scaled by stock prices with control variables. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

(Panel A)

\[
\Delta INSTIT = \beta_0 + \beta_1 EPS1/P (EPS2/P, EPS1_indu/P, EPS2_indu/P, Voj/P, Vpeg/P) + \beta_2 \ln SIZE + \beta_3 \text{YIELD} + \beta_4 \text{BETA} + \beta_5 \ln B/M
+ \beta_6 \text{LEVERAGE} + \beta_7 \text{VOLUME} + \beta_8 \text{Lag(Ret12)} + \text{Year Dummies} + \text{Industry Dummies} + \epsilon
\]

(Panel B)

\[
\Delta INSTIT = \beta_0 + \beta_1 EPS1/P (EPS2/P, EPS1_indu/P, EPS2_indu/P, Voj/P, Vpeg/P) + \beta_2 \text{TARGET} + \beta_3 \text{RECOM} + \beta_4 \ln SIZE + \beta_5 \text{YIELD}
+ \beta_6 \text{BETA} + \beta_7 \ln B/M + \beta_8 \text{LEVERAGE} + \beta_9 \text{VOLUME} + \beta_{10} \text{Lag(Ret12)} + \text{Year Dummies} + \text{Industry Dummies} + \epsilon
\]

Adj. R² is the adjusted R² for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
(Panel A)

| Variables          | (1) |          | (2) |          | (3) |          | (4) |          | (5) |          | (6) |          |
|--------------------|-----|----------|-----|----------|-----|----------|-----|----------|-----|----------|-----|----------|
|                    | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. |
| Intercept          | 0.036 | 0.84     | 0.003 | 0.07     | 0.039 | 0.91     | 0.014 | 0.33     | 0.021 | 0.48     | 0.021 | 0.49     |
| EPS1/P             | 0.064 | **2.28   |       |          | 0.130 | ***4.21  | 0.063 | **2.46   |       |          | 0.129 | ***4.02  |
| EPS2/P             |       |          |       |          |       |          | 0.130 | ***4.21  |       |          |       |          |
| EPS2_indu/P        |       |          |       |          |       |          |       |          | 0.001 | ***3.00  |       |          |
| V_{OF}/P           |       |          |       |          |       |          |       |          |       |          |       |          |
| V_{PEG}/P          |       |          |       |          |       |          |       |          |       |          |       |          |
| InSIZE             | -0.001 | -0.97    | -0.000 | -0.35    | -0.001 | -0.87    | -0.000 | -0.24    | -0.000 | -0.54    | -0.000 | -0.54    |
| YIELD              | 0.069 | 0.52     | 0.033 | 0.25     | 0.093 | 0.70     | 0.064 | 0.48     | 0.090 | 0.68     | 0.100 | 0.75     |
| BETA               | -0.001 | -0.29    | -0.001 | -0.19    | -0.002 | -0.37    | -0.002 | -0.32    | 0.002 | 0.34     | 0.001 | 0.30     |
| InB/M              | -0.015 | ***-3.83 | -0.016 | ***-4.26 | -0.014 | ***-3.78 | -0.016 | ***-4.12 | -0.013 | ***-3.42 | -0.013 | ***-3.43 |
| LEVERAGE           | -0.011 | -0.88    | -0.016 | -1.29    | -0.010 | -0.84    | -0.015 | -1.24    | -0.021 | -1.63    | -0.021 | -1.62    |
| VOLUME             | 0.922 | ***2.77  | 0.853 | **2.57   | 0.950 | ***2.86  | 0.922 | ***2.78  | 0.899 | ***2.70  | 0.903 | ***2.72  |
| Lag(Ret12)         | -0.003 | -1.14    | -0.0038 | -1.14    | -0.004 | -1.23    | -0.004 | -1.30    | -0.003 | -0.93    | -0.003 | -0.95    |
| Industry Dummies   | Included |        | Included |        | Included |        | Included |        | Included |        | Included |        |
| Year Dummies       | Included |        | Included |        | Included |        | Included |        | Included |        | Included |        |
| Adj. R²            | 0.175 |          | 0.183 |          | 0.176 |          | 0.182 |          | 0.178 |          | 0.178 |          |
| N.                 | 1,421 |          | 1,421 |          | 1,421 |          | 1,421 |          | 1,421 |          | 1,421 |          |
Table 7. Regressions of Sell-side Analysts’ information on Institutional Ownership \((E/P, Voj/P, Vpeg/P)\) (Continued) (Panel B)

| Variables         | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|-------------------|---------|---------|---------|---------|---------|---------|
|                   | Coef.   | t stat. | Coef.   | t stat. | Coef.   | t stat. |
| Intercept         | -0.024  | -0.50   | -0.031  | -0.64   | -0.027  | -0.56   |
| \(E/P\)           | 0.041   | 1.40    |         |         |         |         |
| \(EPS2/P\)        |         |         | 0.110   | ***     | 3.26    |         |
| \(EPS1\_indu/P\)  |         |         | 0.043   | 1.64    |         |         |
| \(EPS2\_indu/P\)  |         |         | 0.107   | ***     | 3.12    |         |
| \(INSTIT\)        | 0.008   | 0.71    | 0.001   | 0.10    | 0.009   | 0.80    |
| \(REV\_O\)        | 0.014   | **      | 0.011   | 1.61    | 0.013   | **      |
| \(YIELD\)         | -0.001  | -0.95   | -0.000  | -0.49   | -0.001  | -0.86   |
| \(TARGET\)        | 0.043   | 0.32    | 0.017   | 0.13    | 0.059   | 0.44    |
| \(BETA\)          | -0.002  | -0.44   | -0.001  | -0.29   | -0.003  | -0.49   |
| \(lnB/M\)         | -0.013  | ***     | -0.015  | ***     | -0.013  | ***     |
| \(LEVERAGE\)      | -0.011  | -0.90   | -0.015  | -1.18   | -0.011  | -0.88   |
| \(VOLUME\)        | 0.972   | ***     | 0.911   | ***     | 0.987   | ***     |
| \(Lag(Ret12)\)    | -0.005  | -1.53   | -0.005  | -1.49   | -0.005  | -1.56   |
| Industry Dummies  | Included |         | Included |         | Included |         |
| Year Dummies      | Included |         | Included |         | Included |         |
| Adj. R²           | 0.179   |         | 0.185   |         | 0.180   |         |
| N.                | 1,421   |         | 1,421   |         | 1,421   |         |
5.3 Change variables ($\Delta V/P$, $\Delta TARGET/P$ and $\Delta RECOM$) instead of level

According to the prior research that shows the return profitability of a change in sell-side analysts’ target price or recommendation (Bradshaw et al. 2012; Jegadeesh et al. 2006), in this robustness test, I use a change in sell-side analysts’ forecast information ($\Delta VRIVC/P$, $\Delta VRIVI/P$, $\Delta VAVER/P$, $\Delta TARGET/P$, and $\Delta RECOM$) instead of using the level of forecast information ($V_{RIVC}/P$, $V_{RIVI}/P$, $V_{AVER}/P$, $TARGET/P$, and $RECOM$).

Panel A of table 8 shows that the coefficients on $\Delta VRIVC/P$, $\Delta VRIVI/P$, $\Delta VAVER/P$, and $\Delta RECOM$ are positively associated with the change of the institutional ownership. Therefore, I conclude that if $V/P$ ratios and recommendation increase for the year, then the institutional investors’ ownership increases.

Furthermore, I examine whether institutional investors analyze the valuation process in addition to using recommendation. Panel B of table 8 shows that the coefficients on $\Delta VRIVC/P$, $\Delta VRIVI/P$, $\Delta VAVER/P$, and $\Delta RECOM$ are positively associated with the change of the institutional ownership. It means that the institutional investors incorporate a change in $V/P$ ratios in addition to a change in recommendation during the year.
Table 8. Regressions of the change of sell-side Analysts’ information on Institutional Ownership

This table presents the pooled sample regressions of a change in institutional ownership on the change of equity value estimates inferred from analysts’ earnings forecasts scaled by stock prices, the change of target prices scaled by stock prices, and the change of stock recommendations with control variables. See the notes of Table 1 and 2 for the definitions of the variables. The regression equations are as follows.

(Panel A)

< Equation 20 ~24 > ΔINSTIT = β0 + β1 ΔVRIVC/P (ΔVRIV/P, ΔVAVER/P, ΔTARGET/P, ΔRECOM) + β2 lnSIZE + β3 YIELD + β4 BETA + β5 lnB/M

+ β6 LEVERAGE + β7 VOLUME + β8 Lag(Ret12) + Year Dummies + Industry Dummies + ε

(Panel B)

< Equation 25~27 > ΔINSTIT = β0 + β1 ΔVRIVC/P (ΔVRIV/P, ΔVAVER/P, ΔTARGET/P, ΔRECOM) + β2 TARGET + β3 RECOM + β4 lnSIZE + β5 YIELD

+ β6 BETA + β7 lnB/M + β8 LEVERAGE + β9 VOLUME + β10 Lag(Ret12) + Year Dummies + Industry Dummies + ε

Adj. R² is the adjusted R² for the regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5%, and 10% level or better.
(Panel A)

| Variables          | (1)        | (2)        | (3)        | (4)        | (5)        |
|--------------------|------------|------------|------------|------------|------------|
|                    | Coef.      | t stat.    | Coef.      | t stat.    | Coef.      | t stat.    | Coef.      | t stat.    | Coef.      | t stat.    |
| Intercept          | 0.053      | 1.42       | 0.052      | 1.37       | 0.052      | 1.38       | 0.057      | 1.50       | 0.048      | 1.25       |
| \(\Delta V_{RIVC}/P \) | 0.016 ***  | 4.96       | 0.005 **   | 2.53       | 0.007 ***  | 3.62       |           |            | 0.001      | 1.28       |
| \(\Delta V_{RIVI}/P \) |           |            | 0.007 ***  | 3.62       |           |            | 0.027 **  | 2.00       |            |            |
| \(\Delta V_{AVER}/P \) |           |            |            |            |           |            |            |            |            |            |
| \(\Delta \text{TARGET}/P \) | 0.000      | -1.35      | -0.001     | -1.23      | -0.001     | -1.22      | -0.001     | -1.19      | -0.001     | -0.90      |
| \(\Delta \text{RECOM} \) |           |            |            |            |           |            | 0.067      | 0.51       | 0.108      | 0.82       |
| \(\ln \text{SIZE} \) | -0.001     | -1.35      | -0.001     | -1.23      | -0.001     | -1.22      | -0.001     | -1.19      | -0.001     | -0.90      |
| \(\text{YIELD} \) | 0.067      | 0.51       | 0.108      | 0.82       | 0.127      | 0.96       | 0.113      | 0.85       | 0.100      | 0.75       |
| \(\text{\text{BETA}} \) | 0.000      | 0.09       | -0.000     | -0.10      | -0.001     | -0.32      | -0.004     | -0.66      | -0.005     | -0.88      |
| \(\ln \text{B/M} \) | -0.008 **  | -2.37      | -0.011 *** | -3.14      | -0.010 *** | -2.81      | -0.010 *** | -2.98      | -0.010 *** | -2.89      |
| \(\text{LEVERAGE} \) | -0.010     | -0.92      | -0.009     | -0.85      | -0.011     | -1.02      | -0.008     | -0.76      | -0.009     | -0.78      |
| \(\text{VOLUME} \) | 0.768 **   | 2.34       | 0.799 **   | 2.42       | 0.757 **   | 2.30       | 0.808 **   | 2.44       | 0.840 **   | 2.53       |
| \(\text{Lag(Ret12)} \) | -0.001     | -0.51      | -0.001     | -0.50      | -0.001     | -0.55      | -0.002     | -0.59      | -0.003     | -1.04      |

Industry Dummies: Included
Year Dummies: Included
Adj. R^2: 0.178, 0.167, 0.171, 0.164, 0.166
N.: 1,365, 1,365, 1,365, 1,365, 1,365
Table 8. Regressions of the change of sell-side Analysts’ information on Institutional Ownership (Continued)
(Panel B)

| Variables     | (6)                  | (7)                  | (8)                  |
|---------------|----------------------|----------------------|----------------------|
|               | Coef. | t stat. | Coef. | t stat. | Coef. | t stat. |
| Intercept     | 0.065 * | 1.75 | 0.068 * | 1.80 | 0.066 * | 1.77 |
| ∆VRIVC/P      | 0.016 *** | 4.70 |           |        |        |        |
| ∆VRIVI/P      | 0.005 ** | 2.23 |           |        |        |        |
| ∆VAVER/P      |           |        | 0.008 *** | 3.63 |        |        |
| ∆TARGET/P     | -0.000 | -0.13 | 0.000 | 0.71 | 0.000 | 0.73 |
| ΔRECOM        | 0.022 | 1.64 | 0.025 * | 1.82 | 0.027 ** | 1.98 |
| lnSIZE        | -0.001 | -1.04 | -0.002 | -1.07 | -0.001 | -1.00 |
| YIELD         | 0.094 | 0.695 | 0.141 | 1.04 | 0.153 | 1.13 |
| BETA          | 0.004 | 0.84 | 0.003 | 0.64 | 0.002 | 0.44 |
| lnB/M         | -0.009 ** | -2.46 | -0.011 *** | -3.18 | -0.010 *** | -2.80 |
| LEVERAGE      | -0.008 | -0.73 | -0.008 | -0.68 | -0.009 | -0.85 |
| VOLUME        | -0.000 | -0.29 | -0.000 | -0.21 | -0.000 | -0.27 |
| Lag(Ret12)    | -0.002 | -0.59 | -0.001 | -0.57 | -0.002 | -0.66 |
| Industry Dummies | Included |     | Included |     | Included |     |
| Year Dummies  | Included |     | Included |     | Included |     |
| Adj. R²       | 0.177 |     | 0.166 |     | 0.171 |     |
| N.            | 1,365 |     | 1,365 |     | 1,365 |     |
VI. CONCLUSION

This paper examines how institutional investors interact with sell-side analysts in detail. I focus on the role of institutional investors as more sophisticated stock market participants who may analyze sell-side analysts’ stock valuation process in addition to using their outputs as recommendation, target price. Furthermore, I examine whether institutional investors can differentiate good information from bad information provided by sell-side analysts.

By using a sample of 1,421 firm/year observations in Korean stock market during year 2001 and 2011, I find that institutional investors increase their shares of equity for the firms for which analysts issue favorable information via their V/P ratios, meaning that institutional investors may take an active role as a mechanism to incorporate V/P ratios (value to price) derived from earnings forecast information to analyze the whole valuation process, in addition to using the outputs as Recommendation. Furthermore, I find that institutional investors can differentiate the good information from bad information using sell-side analysts’ accuracy of earning forecast information. On the other way round, I find that sell-side analysts do not use information produced from buy-side investors’ trading behavior. Therefore, I can conclude that the main results support the causality relationship that institutional investors trade by looking at the sell-side analysts’ valuation process in detail, and by using their information only when the earnings forecast information is more accurate, not the other way round.

This study makes several important contributions to the literature as follows. First, this study can shed some lights on how both sophisticated stock market participants interact together. I suggest that information flows from sell-side analysts to institutional
investors, not the other way round. Secondly, this paper extends the prior literature which factors bring about institutional investors’ sophistication. This paper finds the active role of the institutional investors as a mechanism to incorporate earnings forecast information in addition to explicit outputs as recommendation to analyze sell-side analysts’ whole valuation process. Moreover, the results report that institutional investors selectively incorporate sell-side analysts’ information only when the quality of information is high. Taken together, this study enhances the knowledge about the unobserved interaction between important stock market participants who are considered to have taken a role to enhance stock market efficiency.
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