Cross-Firm Information in Analyst Reports

Abstract

Analysts often mention related (economically linked) stocks whose performance could be influenced by the firm highlighted in their report. In this study, I investigate the informational value of such cross-firm information in analyst reports. Specifically, I analyze whether and how such information gradually is incorporated into their estimates for the related firms and causes return predictability. I find that revisions in the target prices of the highlighted stocks induce subsequent revisions in their target prices for the related stocks. Furthermore, these revisions for the highlighted stock are positively associated with the subsequent stock returns for related firms. Finally, the positive association with stock returns is attributed to the lead-lag relationship in the target prices. These results support the informational value of cross-firm information and the gradual incorporation of the information into analysts' and investors' expectations for the related stocks.

Keywords: financial analyst; cross-firm information; target price; information diffusion

JEL classification: G14, G24, G41

1. Introduction

Analysts' research reports are regarded as an important source of information for stock markets. Along with company fundamentals, financial analysts research macroeconomic and microeconomic conditions to predict company performance

(especially, earnings). Eventually, they provide an estimated fair price, called the target price, based on the stock's outlook. By comparing the target price with current prices, they recommend buying or selling a company's stock. Several studies have reported that analyst outputs (on target prices, earnings forecasts, and stock recommendations) contain economically significant information. Specifically, revisions in target prices (Brav and Lehavy, 2003; Asquith et al., 2005), changes in stock recommendations (Stickel, 1995; Womack, 1996; Altinkiliç and Hansen, 2009; Ivković and Jegadeesh, 2004), and revisions in earnings forecasts (Givoly and Lakonishok, 1979; Francis and Soffer, 1997; Altınkılıç et al., 2013) have significant informational value for the valuation of a highlighted stock (the stock on which the analyst report is issued).

Additionally, financial analysts mention not just the highlighted stock but some related stocks in their reports when their (related firms') performance is expected to be affected by the performance and events regarding the highlighted stock. Yet, many studies focus only on their informational value for the highlighted firms, and not on the value of this cross-firm information in predicting the performance and intrinsic value of the related firms. Specifically, I should mention that there could be a delay in the incorporation of this cross-firm information into the same analyst's expectations for the related firms. Several studies show that analysts do not simultaneously update their estimates in response to new information. Francis and Philbrick (1993) and Hwang and Lou (2010) find that analysts' stock recommendations lead their earnings forecasts. Thus, there could be a time lag in the incorporation of cross-firm information into analysts' estimates between highlighted and the corresponding related firms. Specifically, analysts' estimates for the related firms could incorporate cross-firm information, which is mentioned in their reports for the highlighted firms, with lag.

Furthermore, this lagged incorporation of cross-firm information could result in return predictability. Specifically, cross-firm information mentioned in a report for a highlighted firm could predict subsequent returns of the related firms. Miwa (2013, 2022) shows that gradual updates of analysts' estimates induce return predictability. Furthermore, since the estimated impact on the related firms' performance and valuation is not explicitly shown in the report, the more significant delayed price reaction of the related firms is expected for cross-firm information. Therefore, in this study, I analyze whether and how this cross-firm information is incorporated into the same analyst's expectations and stock prices of related firms.

My analysis is also expected to provide evidence of gradual information diffusion among economically linked firms. Studies have assessed the diffusion (and gradual incorporation) of cross-form information by analyzing the lead-lag effect in cross-sectional returns. According to Lo and MacKinlay (1990), large firms could be leaders and small firms could be followers. Some studies (e.g., Lo and MacKinlay, 1990; Chordia and Swaminathan, 2000; Anderson et al., 2012) show that only a small fraction of non-synchronous trading or time-varying expected returns could explain such lead-lag relations. There is considerable evidence (e.g. Brennan et al., 1993; Badrinath et al., 1995; Chordia and Swaminathan, 2000) of the lead-lag effect from stocks highly exposed to investor attention proxies (e.g., analyst coverage and trading volume) to those that are not. While these studies do not specify the path of gradual incorporation of information, some identify the path (link) and provide stronger evidence for the gradual incorporation of information between economically linked firms. Scherbina and Schlusche (2015) identify the links using historical return association and show that identified leaders can reliably predict their followers' returns, suggesting gradual

incorporation of cross-firm information. Cohen and Frazzini (2008) and Cao et al. (2016) identify the cross-firm information using customer-supplier and strategic alliance data, respectively. These studies identify the gradual incorporation of the information by showing a strong lead-lag effect on stock prices through these links.

However, these identification methodologies could contain large estimation errors and cannot capture a wide variety of cross-firm information. For instance, since Scherbina and Schlusche (2015) identify the link by using historical prices, the estimation of the links could contain large estimation errors and cannot capture temporal (dynamic) cross-firm information. Frazzini (2008) and Cao et al. (2016) consider only cross-firm information propagated through customer-supplier networks and strategic alliances. By contrast, I use cross-firm information on economically linked firms mentioned by professional analysts. Since such analysts carefully identify economic links through detailed fundamental analyses, this cross-firm information can capture a wide variety of cross-firm information through static and dynamic links with few identification errors. Additionally, I can directly identify the gradual incorporation of cross-firm information of economically linked firms by observing analysts' target prices and earnings forecasts for the highlighted and related firms. Therefore, my methodology is expected to provide a more direct and robust assessment of the gradual incorporation of cross-firm information through economic links.

In my study, I first examine whether the fundamental information flow identified in analysts' revisions in earnings forecasts and target prices of the highlighted stock induces subsequent revisions in their earnings forecasts and target prices for related

stocks.[1] To this end, I first identify the highlighted stock and its related stocks (the economic links) in each report. I then analyze the lead-lag relationship between analysts' target prices and earnings forecasts between them. I first clarify whether and how the magnitude of revisions in analyst estimates (specifically, their target prices and earnings forecasts) of the highlighted stock induces subsequent updates of such estimates for related stocks because the magnitude of the revisions would be related to the magnitude of cross-firm information for the highlighted stock and related stocks. I find a strong lead-lag relationship in analysts' target prices—significant revisions in analysts' target prices for the highlighted firm, reflecting changes in the consequences of analysts' company research, induce subsequent revisions in the target prices for related firms.

Next, I analyze whether the positive or the negative lead-lag relationship is dominant. The direction of the lead-lag relationship could be positive. For example, industry shocks can affect multiple firms in an industry in the same direction. In addition, the negative shock caused by questionable practices in one firm may cause investors to lose faith in related firms. By contrast, in a mature market, a loss in the market share of a specific firm could result in an increase in the market share of a competitor. In such a case, a negative lead-lag relationship could be observed. In terms of which relation is dominant, Scherbina and Schlusche (2015) show that positive leadership (lead-lag relation) is long-lasting, while negative leadership is short-lived. Consistent with their findings, I find that the positive lead-lag relationship is dominant. Positive (negative) revisions in analysts' target prices mainly induce subsequent positive (negative) revisions in their target prices for related firms. The positive relationship is robust even

[1] Due to the possibility of reversal causality from revisions of the related firm to those of the highlighted firm, we analyze the lagged relationship, i.e. the association of revisions of the related firm with the lagged revisions of the highlighted firm.

after controlling for serial correlation in revisions in target prices and the influence of other analysts' target prices.

I then analyze whether the information flow identified by revisions in target prices for the highlighted firm affects the subsequent stock returns of the related firms. First, I find that revisions in target prices for the highlighted stocks are associated with subsequent returns on the related stock, indicating that positive (negative) news identified by positive (negative) revisions in target prices induce subsequent positive (negative) returns for the related firms. Furthermore, the mediation analysis reveals that the return predictability is (at least partially) attributed to the lead-lag relationship in analysts' target prices between the highlighted and its related stocks. This result supports the view that the gradual incorporation of cross-firm information into analysts' target prices for the related stocks affects their stock returns.

Additional analyses reveal that this lead-lag relationship and its price impact on the related stock (the follower) are stronger when the highlighted firm (the leader) is covered by more analysts and the report is written by a star analyst. Stocks with larger analyst coverage may be more influential on stock markets and receive more attention and be prioritized by investors and analysts. Thus, the fundamental news of such firms could have a more delayed price impact on related stocks. In addition, because star (prestigious) analysts could be more informed than others, the cross-firm information provided by star analysts could have more informational value. Hence, such cross-form information could induce substantial lead-lag relations and have a substantial impact on the stock prices of the related stocks.

In summary, I show that cross-firm information mentioned in the analysts' reports is slowly incorporated into their estimates for economically linked stocks, resulting in

the lead-lag relationship in analyst estimates across stocks and in turn, the predictive power for subsequent stock returns of the related firms.

This study contributes to the existing literature in two ways. First, it presents new informational content in analysts' reports. Since analysts clearly mention related firms expected to be affected by the content of the report, their reports could contain additional information regarding stock valuation and company performance of not only the highlighted stock but also the related stocks. Previous studies rarely focused on or analyzed the informational value of such cross-firm information in analyst reports. I present, for the first time, evidence of their informational value by showing that revisions in analysts' target prices for highlighted stocks predict related firms' target prices and stock returns.

Second, my study provides robust evidence of slow information diffusion across stocks. I use the economic links mentioned in the professional analysis. Since these links are mentioned in careful fundamental analyses, they would be more convincing than those used in prior studies, providing stronger evidence for the information diffusion through economic links. Furthermore, in each report, analysts highlight a primary stock as well as related firms whose performance is not the main topic. Thus, my findings (the delayed incorporation of information mentioned in the report for highlighted stocks into their target prices and stock prices of the related stocks) strongly support the view that slow information diffusion is induced by the difference in market participants' (analysts') priority and attention.

The paper proceeds as follows. Section 2 documents the lead-lag relationship in analysts' estimates between the highlighted stock and related stocks. Section 3 provides evidence that the lead-lag relationship results in a significant price impact on the related

stocks. Section 4 documents when the lead-lag relationship and its price impact are especially pronounced. Section 5 concludes the paper.

2. Lead-lag relationship in analyst's report

2.1. Association with an update of analysts' expectations

I assess whether the cross-firm information mentioned in analysts' reports affects their estimates for the related firms. I identify highlighted and related firms and analysts' estimates for these firms using FactSet Research Connect, a global database that provides electronic access to reports from hundreds of market research firms and rating agencies. For instance, if an analyst issues a company report for stock *j* (on day *t*) and mentions stock *i* as a related stock, I suppose that there is an economic link (and some information flow) from stock *j* (the highlighted stock) to stock *i* on day *t*.[2] For convenience, in such a case, I also call stock *j* the linked stock of stock *i*. If multiple financial analysts mention the link from stock *j* to *i* on day *t*, I merge the samples into one. Specifically, as analysts' revision (information flow) measures for the merged link, I calculate the average of revisions in estimates (i.e., target prices, earnings forecasts, and stock recommendations) of analysts who mention the economic link. I define $D\_link_{i,j,t}$ as the dummy variable that takes the value of one if there is an economic link (and some information flow) from stock *j* to stock *i* on day *t* ($D\_link_{i,j,t}$ = 0 means there

[2] It is also possible that there is an economic link from stock *i* (related stock) to stock *j* (highlighted stock). However, because my interest is to examine whether information contained in analyst report for stock *j* (highlighted stock) is incorporated into valuation of stock *i, we only consider* the link from stock *j* to stock *i*.

is no economic link). [3] I identify153,852 links using analyst reports released between 2008 and 2021. I test across all links $\{i, j, t|D\_link_{i,j,t} = 1\}$[4] to analyze the incorporation of the cross-firm information mentioned in the report for stock *j* (highlighted stock) into analysts' estimates and prices of stock *i* (the related stock) around the publication of the report (day *t*).

I estimate the magnitude of the cross-firm information by how much analysts who mention the link revise their earnings forecasts and target prices for stock *j* (the highlighted stock).[5] I analyze the time lag in the incorporation of cross-firm information within the same analysts' (or broker's) estimations across firms, that is, whether revisions in estimates (target prices and earnings forecasts) by an analyst who mentions the economic link induce subsequent revisions in related firms' target prices and earnings forecasts of the analyst.[6]

To analyze the gradual incorporation of cross-firm information into analysts' estimates for the related stock (stock *i*), I analyze whether updates in estimates (e.g., target prices and earnings forecasts) for stock *i* (the related firm) by the analysts are affected by the magnitude of the lagged revisions in their estimations for the highlighted stocks (stock *j*). To this end, I estimate a logistic regression model for all links from stock *j* to *i* $\{i, j, t|D\_Link_{i,j,t} = 1\}$.

[3] If in an analyst report for stock *a* (the highlighted stock), multiple stocks (e.g., stocks *b* and *c*) are mentions as related stocks, I suppose that there are multiple links (a link from stock *a* to stock *b*, and that from *a* to *c*).
[4] Even if I do not merge the samples, the results hold.
[5] Stock recommendations are revised due to fundamental changes as well as price changes. Furthermore, since recommendations are constrained into a few categories (buy, sell, and hold), the frequency of their revisions is fewer than that of revisions in earnings forecasts and target prices. Thus, I consider revisions in stock recommendations as a noisier and naïve proxy for fundamental news flow. Although results using revision in stock recommendation still support my hypotheses, their statistical significance is weaker.
[6] I do not analyze the contemporaneous association due to the possibility of reversal causality from analysts' revisions for the related stock to those for the highlighted stock.

$$D\_FwdRev_{i,t} = \alpha_0 + \beta_1 ABS\_Rev\_TGT_{j,t} + \beta_2 ABS\_Rev\_EPS_{j,t} + (Controls) \quad (1)$$

The dependent variable ($D\_FwdRev_{i,t}$) is either $D\_FwdRev\_TGT_{i,t}$ or $D\_FwdRev\_EPS_{i,t}$ where $D\_FwdRev\_TGT_{i,t}$ is a dummy variable that takes the value of one if there are any revisions in the target prices of the related stock *i* (by analysts who mention the link) for days *t*+2 through *t*+10 (*t* denotes the publication date of their report); $D\_FwdRev\_EPS_{i,t}$ is the dummy variable that equals one if there are any revisions in their earnings forecast of the related stock *i* for days *t*+2 through *t*+10.

$ABS\_Rev\_TGT_{j,t}$ is defined as the absolute value of the change ratio of analysts' target prices for stock *j* (the highlighted stock in their report); $ABS\_Rev\_EPS_{j,t}$ is defined as the absolute value of the change in their earnings per share (EPS) for stock *j* deflated by its price; These are the magnitude of revisions in their target prices and earnings forecasts for the highlighted stock, respectively.

The regression model includes the following control variables. First, updates of analysts' estimations for stock *i* (the related stock) could be induced by revisions in their estimations for stock *j* (the highlighted stock) as well as revisions in estimations of other analysts (who do not mention the economic link) for stock *j*. Thus, I define other analysts' consensus target prices and EPS forecasts (for stock *j*) as averages of target prices and EPS forecasts made by analysts who do not mention the link from stock *j* to stock *i*, respectively. Subsequently, I include the magnitude of lagged revisions in other analysts' consensus target prices and earnings forecasts for stock *j* (the highlighted stock), denoted as $ABS\_Rev\_ConTGT_{j,t}$ and $ABS\_Rev\_ConEPS_{j,t}$, respectively. Specifically, $ABS\_Rev\_ConTGT_{j,t}$ is defined as the absolute value of the change ratio of other analysts' consensus target prices for the stock *j* for days *t* through *t*+1;

$ABS\_Rev\_ConEPS_{j,t}$ is defined as the absolute value of change in other analysts' consensus EPS for days *t* through *t*+1 deflated by the (stock *j*'s) price. The inclusion of these variables is also expected to control for the direct impact of fundamental news around the report publication because the effect is not limited to analysts who mention the economic link.[7]

Furthermore, I include the magnitude of lagged revisions in target prices and EPS forecasts for the related stock (stock *i*). Analysts can gradually incorporate common factor shocks (e.g., macro shocks) that affect a wide range of stocks (including the highlighted and related stocks). In such a case, the association between revisions in analysts' estimations for the related stock (stock *i*) and lagged revisions in their estimations for the highlighted stock (stock *j*) does not always mean the gradual incorporation of cross-firm information into stock *i*. To mitigate this possibility, I include the magnitude of a revision in target prices and earnings forecasts by analysts (analysts who mention the link) for stock *i* for day *t* through *t*+1 (denoted as $ABS\_Rev\_TGT_{i,t}$ and $ABS\_Rev\_EPS_{i,t}$, respectively) and that in other analysts' consensus ones (denoted as $ABS\_Rev\_ConTGT_{i,t}$ and $ABS\_Rev\_ConEPS_{i,t}$, respectively).

I also include stock recommendation variables. Although changes in stock recommendations are naïve indicators of fundamental information flow, they may affect subsequent updates of analysts' target prices and earnings forecasts. Thus, I include the magnitude of revisions in analysts' recommendations for the highlighted and related stocks ($ABS\_Rev\_REC_{j,t}$ and $ABS\_Rev\_REC_{i,t}$) and revisions in other analysts'

[7] The inclusion of these variables is expected to control for the impact of disclosure events around the publication day of the analyst report.

consensus recommendations ($ABS\_Rev\_ConREC_{j,t}$ and $ABS\_Rev\_ConREC_{i,t}$). In addition, as the level of recommendation might also affect the frequency of the update of their estimates, I include their recommendations for the highlighted and related stocks ($REC_{j,t}$ and $REC_{i,t}$) and the other analysts' consensus forecasts (Con $REC_{j,t}$ and $ConREC_{i,t}$).

Since analysts may piggyback on recent news or events (Li et al., 2015), the regression model includes an absolute value of the abnormal returns of stock *i* (the related stock) for day *t*-10 through day *t*-1 ($ABS\_PRET_{i,t}$). Abnormal returns are calculated based on the Fama-French three-factor model with the Carhart momentum factor (Carhart four-factor model). In addition, to control for the direct information flow from earnings announcements, I add the degree of earnings surprise measures of the highlighted and (corresponding) related stocks. I first define the surprise measure for the related stock (denoted as $SUE_{i,t}$) as the difference between the consensus forecasts for the most recently reported quarterly EPS and the corresponding reported (actual) EPS denominated by the corresponding stock price if there is an earnings announcement from day *t*-1 through *t*+1 (otherwise zero). I then define the magnitude of earnings surprise for the highlighted and related stocks ($ABS\_SUE_{j,t}$ and $ABS\_SUE_{i,t}$, respectively) as the absolute values of $SUE_{j,t}$ and $SUE_{i,t}$, respectively, and I include these measures in the regression model (1).

To control for analysts' reactions to firm characteristics (of the related firm), the regression model includes firm size ($SIZE_{i,t}$), measured as the logarithm of the market capitalization, and book-to-market ratio ($BM_{i,t}$), measured as the book value of equity divided by the market value of equity. Detailed definitions of the explanatory variables

are provided in the Appendix.

The descriptive statistics and correlations between the explanatory variables are shown in Table 1. Table 1(a) (the rows of D_Fwd_Rev_EPS(Related) and D_Fwd_Rev_TGT(Related)) shows that 24.6% and 15.2% of earnings forecasts and target prices for the related stocks (i.e., $D\_FwdRev\_TGT_{i,t}$ and $D\_FwdRev\_EPS_{i,t}$, respectively) are revised (non-zero) for day t+2 through t+10. Furthermore, the rows ABS_Rev_EPS (Highlighted) and ABS_Rev_TGT (Highlighted) show that 21.3% and 13.2% of earnings forecasts and target prices for the highlighted stock, respectively, are revised for days t through t+1. The ratio of revisions is lower for target prices than for earnings forecasts. Note that my sample includes reports in which target prices (for the highlighted stocks) are reiterated (non-revision samples) for the following reason. The investors' and analysts' reaction to the revisions reflects not only the pure impact of the revisions but also the impact of the update of the estimates (the impact of issuing analysts' reports). Chen et al. (2017) show that reiterating analysts' recommendations provide some information to investors. Thus, in this study, zero-revision samples are included to control for the price impact attributed to these updates.

Other analysts' consensus earnings forecasts and target prices are more frequently revised. According to the rows of ABS_Rev_ConEPS (related) and ABS_Rev_ConTGT (related), 38.6% and 30.6% of other analysts' consensus earnings forecasts and target prices (for the related stocks) are revised for day t through t+1. The rows of ABS_Rev_ConEPS (Highlighted) and ABS_Rev_ConTGT (Highlighted) show that 55.5% and 50.7% of other analysts' consensus earnings forecast and target price for the

linked (highlighted) stock are revised for day t through t+1.[8]

Table 1(b) reveals that the degree of the revision in target prices for the highlighted stock (ABS_Rev_TGT (Highlighted) in Table 1(b)) is associated with the revision in other analysts' target prices (ABS_Rev_ConTGT (Highlighted)), and the degree of the revision in earnings forecast for the highlighted stock (ABS_Rev_EPS(Highlighted)) is associated with the revision in other analysts' earnings forecasts (ABS_Rev_ConEPS(Highlighted)). Since there is a significant correlation between revisions in analysts' target prices (and earnings forecasts) for a specific stock, the lead-lag relationship could be attributed to the information conveyed by other analysts' estimates; thus, it is necessary to control for these variables when analyzing the lead-lag relation.

As shown in the row of ABS_Rev_REC (Highlighted) in Table 1(a), only 1.3% of stock recommendations for linked (highlighted) stocks are revised; the ratio is significantly smaller than the ratio of revisions in target prices and earnings forecasts (21.3% and 13.2%, respectively).[9] The results suggest that revisions in stock recommendations rarely capture information flow from the highlighted stocks. Therefore, in this study, I analyze the lead-lag relationship in analysts' target prices and earnings forecasts; I do not include revisions in recommendations as a dependent variable. Meanwhile, the magnitude of revisions in recommendations is associated with revisions in target prices and earnings forecasts. For instance, $ABS\_Rev\_REC_{j,t}$ (ABS_Rev_REC (Highlighted) in Table 1(b)) is positively associated with

[8] The result is evident, because revisions in consensus forecast or target prices could be non-zero when at least one of the analysts revises their estimates.
[9] The reason could be that recommendations are constrained into a few categories.

$ABS\_Rev\_TGT_{j,t}$, and $ABS\_Rev\_EPS_{j,t}$ (ABS_Rev_TGT (Highlighted) and ABS_Rev_EPS (Highlighted) in Table 1(b), respectively). Thus, I add stock recommendation variables (i.e., $ABS\_Rev\_REC_{j,t}$, $ABS\_Rev\_REC_{i,t}$, $ABS\_Rev\_ConREC_{j,t}$, and $ABS\_Rev\_ConREC_{j,t}$) for the two economically linked stocks as control variables in the regression model (1).

[Table 1]

Table 2 presents the regression results. The rows of ABS_Rev_TGT(Related) and ABS_Rev_EPS(Related) reveal that the probability of updating analysts' target price and earnings forecast for the related firm is negatively associated with the magnitude of lagged revisions in target prices for the related firm ($ABS\_Rev\_TGT_{i,t}$) and that in earnings forecasts ($ABS\_Rev\_EPS_{i,t}$). This is evident because significant revisions in analysts' target prices and earnings forecasts lower the probability of revisions in their estimates for the same stock in subsequent periods. The results also reveal that the probability of updating analysts' target prices and earnings forecasts for the related firm is positively associated with the magnitude of lagged revisions in other analysts' target price and earnings forecasts for the related firm ($ABS\_Rev\_ConTGT_{i,t}$ and $ABS\_Rev\_ConEPS_{i,t}$), respectively, suggesting that a revision in one analyst's target price and earnings forecast is significantly induced by other analysts' revisions for the same stock. These results indicate the propagation of information among the analysts.

In terms of the gradual incorporation of cross-firm information, the probability of updating the target price and earnings forecast for the related stock *i* ($D\_FwdRev\_EPS_{i,t}$ and $D\_FwdRev\_TGT_{i,t}$) are positively associated with the magnitude of lagged revisions in the target price and earnings forecast for the

highlighted stock j ($ABS\_Rev\_TGT_{j,t}$ and $ABS\_Rev\_EPS_{j,t}$), respectively. In particular, the association is substantially significant for analysts' target prices (1.7890; t=6.22) rather than analysts' earnings forecasts. Since earnings forecasts are merely supplemental (and partial) information regarding target prices (Miwa, 2023), cross-firm information identified by changes in target prices could convey more information regarding firm valuation than that identified by changes in earnings forecasts. In sum, my finding, that is, the lead-lag relationship in analysts' target prices across stocks, suggests that cross-firm information that has enough impact on analysts' fair value estimation for the highlighted stocks is slowly incorporated into the fair value estimation of related firms.

[Table 2]

2.2. Direction of the lead-lag relationship

To assess the direction of the lead-lag relationship discussed above, I examine whether positive (negative) revisions in analysts' target prices for the highlighted firm induce subsequent positive (negative) revisions in their target prices for related firms. I estimate the following regression model with the firm-fixed effect for all links from stock j to stock i $\{i, j, t|\ D\_Link_{i,j,t} = 1\}$:

$$FwdRev\_TGT_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + (Controls) \quad (2)$$

The dependent variable ($FwdRev\_TGT_{i,t}$) is the revision in the target prices for the related stock i (by analysts who mention the link) for days t+2 through t+10. $Rev\_TGT_{j,t}$ is defined as the change ratio of their target prices for the linked (highlighted) stock for days t through t+1. In addition, I include $Rev\_EPS_{j,t}$ and $Rev\_REC_{j,t}$, as control variables: $Rev\_EPS_{j,t}$ is defined as a change in their EPS forecasts for the highlighted

stock for days *t* through *t*+1 deflated by its stock price, and $Rev\_REC_{j,t}$ is defined as a change in their recommendation for the highlighted stock for days *t* through *t*+1.

The regression includes the following control variables. To control for the influence of revisions in other analysts' estimates for the linked (highlighted) stock *j*, I include revisions in other analysts' consensus target prices, earnings forecasts, and stock recommendations for linked stock *j* (denoted as $Rev\_ConTGT_{j,t}$, $Rev\_ConEPS_{j,t}$, and $Rev\_ConREC_{j,t}$, respectively). $Rev\_ConTGT_{j,t}$ is defined as the change ratio of other analysts' consensus target prices for the highlighted stock *j* for days *t* through *t*+1; $Rev\_ConEPS_{j,t}$ is defined as a change in other analysts' consensus EPS forecast for days *t* through *t*+1 denominated by its stock price; $Rev\_ConREC_{j,t}$ is defined as a change in other analysts' consensus recommendations for days *t* through *t*+1. The inclusion of these variables is also expected to control for the direct impact of fundamental news around the publication of the analyst's report for the highlighted stock (day *t*) because this news also affects other analysts' estimates.

I include lagged revisions in analysts' estimates for the related stock to control for the gradual information propagation within the same stock. Specifically, I include revisions to analysts' target prices, EPS forecasts, and stock recommendations regarding the related stock *i* for days *t* through *t*+1 (denoted as $Rev\_TGT_{i,t}$, $Rev\_EPS_{i,t}$, and $Rev\_REC_{i,t}$). I also include revisions in other analysts' consensus (denoted as $Rev\_ConTGT_{i,t}$, $Rev\_ConEPS_{i,t}$, and $Rev\_ConREC_{i,t}$), analysts' recommendations of the two economically linked stocks ($REC_{i,t}$ and $REC_{j,t}$), and other analysts' consensus recommendations for those stocks ($ConREC_{i,t}$ and $ConREC_{j,t}$).

Furthermore, to reduce the influence of analysts' piggybacking on recent news or

events, the model includes nine prior trading day abnormal returns of the related stock *i* ($PRET_{i,t}$), calculated based on the Fama-French three-factor model with the Carhart momentum factor. To control for direct information flow from earnings announcements of the two economically linked stocks, I include $SUE_{i,t}$ and $SUE_{j,t}$ (i.e., earnings surprise measures for related and highlighted stocks, respectively) as control variables in the regression model (2). The regression model also includes firm size ($SIZE$) and the book-to-market ratio (BM). Detailed definitions of the explanatory variables used in this study are provided in the Appendix.

The descriptive statistics and correlations between the explanatory variables are shown in Table 3. The row Fwd_Rev_TGT(Related) in Table 3(a) shows that 9.7% (5.5%) of target prices for the related stocks are revised upward (downward) in a subsequent period (from *t*+2 through *t*+10), and an average of $Fwd\_Rev\_TGT_{i,t}$ is slightly positive. Also, the row Rev_TGT(Highlighted) shows that 8.9% (4.3%) of target prices for the highlighted stocks are revised upward (downward), and an average of $Rev\_TGT_{j,t}$ is also slightly positive. In my sample, the target prices tend to be upgraded rather than downgraded.

In terms of correlation, revisions in target prices for the highlighted stock (Rev_TGT (Highlighted) in Table 3(b)) are significantly associated with revisions in earnings forecast and stock recommendation for the highlighted stock (Rev_EPS (Highlighted) and Rev_REC (Highlighted)), indicating the necessity of controlling for revisions in earnings forecast and stock recommendation. In addition, it is significantly associated with revisions in other analysts' target prices and earnings forecasts for the highlighted stock (Rev_ConTGT (Highlighted) and Rev_ConEPS (Highlighted)), indicating the need to control for contemporaneous revisions in other analysts' estimates.

[Table 3]

Table 4 reveals that revisions in analysts' target prices for the highlighted stock are negatively associated with lagged revisions in target prices for the highlighted stock (Rev_TGT(Highlighted) in the table) and those in earnings forecasts (Rev_EPS(Highlighted) in the table). Significant positive (negative) revisions in analysts' target prices and earnings forecasts could lower the probability of further positive (negative) revisions in these estimates in a subsequent period. The result reveals that revisions in analysts' target price (for the highlighted stock) are positively associated with lagged revisions in the other analysts' target prices (Rev_ConTGT(Highlighted) in the table), suggesting that a positive (negative) revision in an analyst's target price is significantly induced by other analysts' positive (negative) revisions (for the same stock).

In terms of the gradual incorporation of cross-firm information, I find that revisions in analysts' target prices for the related stock are positively associated with lagged revisions in their target prices for the highlighted stock (as shown in Rev_TGT(Highlighted) in Table 4). Positive (negative) revisions in analysts' target prices induce positive (negative) revisions in their target prices of the related firms. $Fwd\_Rev\_TGT_{i,t}$ (revisions in analysts' target prices for the related stock) are also positively associated with $Rev\_ConTGT_{j,t}$ (as shown in Rev_ConTGT(Highlighted)). Positive (negative) revisions in target prices for the related stocks are also induced by positive (negative) lagged revisions in other analysts' target prices (for the highlighted stocks). But, the result also indicates that, even after controlling for the influence of revisions in other analysts' target prices, I can observe the gradual incorporation of cross-firm information between the same analyst's estimations of target prices.

Overall, my results show a positive lead-lag relationship in target prices across stocks, indicating that positive (negative) cross-firm information identified by positive (negative) revisions in target prices for the highlighted stock is gradually incorporated into the same analyst's expectation for the (corresponding) related stock.

[Table 4]

3. The price impact of the lead-lag relation

3.1. Association with stock returns

In the previous section, I found that positive (negative) revisions in analysts' target prices for the highlighted stock induce subsequent positive (negative) revisions in their target prices for the related stocks. Because revisions in target prices have a significant price impact, these positive (negative) revisions for the highlighted stock could be accompanied by subsequent positive (negative) abnormal returns for the related stocks.

To test this prediction, I test across all links from stock *j* (the highlighted stock) to *i* (the related stock) by regressing the model with the firm-fixed effect:

$$FwdRet_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + (Controls) \quad (3)$$

where $FwdRet_{i,t}$ is an abnormal return of the related stock *i* for days *t*+2 through *t*+10, where an abnormal return is based on the Fama-French three-factor model with the Carhart momentum factor, and $Rev\_TGT_{j,t}$ is analysts' revision in target prices for stock *j* (the highlighted stock) for days *t* through *t*+1. The control variables are the same as those in Equation (2). If the revision in analysts' target prices induced by the lead-lag relationship has a significant price impact, the coefficient of $Rev\_TGT_{j,t}$ should be significantly positive.

Table 5 (the rows Rev_TGT, Rev_EPS, and Rev_REC) shows that $FwdRet_{i,t}$ (an

abnormal return of the related stock for days t+2 through t+10) is not significantly associated with the lagged revision in target prices, EPS forecast, and recommendations for the highlighted stock. Furthermore, the rows Rev_ConTGT, Rev_ConEPS, and Rev_ConREC reveal that $FwdRet_{i,t}$ is slightly associated with lagged revisions in other analysts' consensus recommendations but not associated with revisions in consensus target prices and EPS forecasts. Also, the rows "Rev_ConTGT (Highlighted)", "Rev_ConEPS (Highlighted)", and "Rev_ConREC(Highlighted)" show that $FwdRet_{i,t}$ is not significantly associated with revisions in these consensus estimates for the highlighted stocks. As shown in subsection 2.2., revisions in analysts' target prices for the related stocks ($FwdRev\_TGT_{i,t}$) are significantly associated with lagged revisions in their and other analysts' estimates for the related stocks (specifically, $Rev\_TGT_{i,t}$, $Rev\_EPS_{i,t}$, $Rev\_REC_{i,t}$, $Rev\_ConTGT_{i,t}$, $Rev\_ConEPS_{i,t}$) and revisions in other analysts' estimates for the highlighted stocks (specifically, $Rev\_ConTGT_{j,t}$). However, these associations do not result in the return predictability; information indicated by these revisions is already reflected in stock prices.

In contrast, the result (the row "Rev_TGT (Highlighted)") reveals that the stock returns of the related stocks are significantly associated with the lagged revisions in their target prices for the highlighted stock, indicating that positive (negative) revisions in target price for the highlighted stocks induce higher (lower) subsequent stock returns for the corresponding related firms. These results suggest that related stocks' prices slowly incorporate cross-firm information identified by revisions in the target prices of highlighted firms. In other words, the gradual propagation (incorporation) of cross-firm information within the same analyst induces the slow incorporation of information into prices.

[Table 5]

3.2. Mediation by the lead-lag relation

I now analyze whether return predictability associated with cross-firm information is mediated by the lead-lag relationship in their target prices, that is, the association of revisions in target prices for the related stock ($FwdRev\_TGT_{i,t}$) with lagged revisions in target prices for the highlighted stocks. To assess the mediation effect, I add contemporaneous revisions to target prices (revisions to target prices of the related stock for days t+2 through t+10; $FwdRev\_TGT_{i,t}$) in the regression model (3). Subsequently, I examine whether the coefficient of $FwdRev\_TGT_{i,t}$ is significantly positive and whether the indirect effect is statistically significant. Finally, I examine whether and to what extent the coefficient of $Rev\_TGT_{j,t}$, that is, that of the lagged revision in analysts' target price of the highlighted firm, is reduced by adding the contemporaneous revisions ($FwdRev\_TGT_{i,t}$). To this end, the following regression model with the firm-fixed effect for all links from stock j to stock i $\{i, j, t | D\_Link_{i,j,t} = 1\}$ is estimated:

$$FwdRet_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + \beta_2 FwdRev\_TGT_{i,t} + (Controls) \quad (4)$$

The other control variables are the same as those in Equation (2). The regression result in Table 6 shows that the coefficient of $FwdRev\_TGT_{i,t}$ is significantly positive. As shown in the row "Rev_TGT (Highlighted)", compared with the model without the contemporaneous revisions ($FwdRev\_TGT_{i,t}$), that is, the estimation results of the regression model (3), the coefficient of the lagged revisions in target prices for the highlighted stock ($Rev\_TGT_{j,t}$) is reduced by approximately 22% (from 0.0436 to 0.0340). The indirect effect from $Rev\_TGT_{j,t}$ to $FwdRet_{i,t}$ is approximately 0.0098 (0.0269 × 0.3622) and statistically significant (t=5.17, where the test is based on the

Sobel test). [10] These results confirm that the return predictability associated with lagged revisions in target prices for highlighted stocks is partially attributed to the lead-lag relationship in analysts' target prices across stocks.

[Table 6]

4. Interaction effect

4.1. The lead-lag relationship

In this section, I analyze when the lead-lag relationship and the associated return predictability are pronounced.

First, I analyze the effect of the interaction with firm size. Lo and MacKinlay (1990) argue that small-cap stocks incorporate information more slowly than large-cap stocks. Thus, since these differences in speed could induce the lead-lag relationship, the slow information transition could be more substantial when the market capitalization of the related firm is smaller than that of the highlighted firm. Hence, I analyze whether and how the lead-lag relationship is affected by the two economically linked stocks' market capitalization. To assess the interaction effect of firm size of the highlighted and related stocks, I add the interaction of these stocks' market capitalization ($SIZE_{i,t} * ABS\_Rev\_TGT_{j,t}$ and $SIZE_{j,t} * Rev\_TGT_{j,t}$) to models (1) and (2), respectively. When the difference in market capitalization between these economically-linked firms is larger, a delay in the incorporation of cross-information could be more substantial. Thus, the coefficient of $SIZE_{i,t} * Rev\_TGT_{j,t}$ is negative, while the coefficient of $SIZE_{j,t} *$

[10] The indirect effect can be obtained by multiplying the coefficient of $Rev\_TGT_{,j,t}$ for $FRev\_TGT_{i,t}$ (0.0269) by the coefficient of $FRev\_TGT_{i,t}$ for $Ret_{i,t}$ (0.3622).

$Rev\_TGT_{j,t}$ is positive.

Second, I analyze whether the analyst coverage number of the two economically linked stocks affects the lead-lag relationship because the analyst coverage number could be a proxy for investors' attention. Brennan et al. (1993) show that market participants' responses are quicker for firms covered by more analysts. To assess the interaction effect of analyst coverage, I define $N\_Cov_{i,t}$ as the log of the number of analysts covering stock *i* (the related stock) plus one. Subsequently, I add the interaction of $N\_Cov_{i,t}$ with $ABS\_Rev\_TGT_{j,t}$ ($N\_Cov_{i,t}$ * $ABS\_Rev\_TGT_{j,t}$) and that with $Rev\_TGT_{j,t}$ ($N\_Cov_{i,t}$ * $Rev\_TGT_{j,t}$) to models (1) and (2), respectively. When stock *i* (the related stock) is covered by fewer analysts ($N\_Cov_{i,t}$ is smaller), the incorporation of the cross-firm information mentioned in analysts' report for stock *j* into their expectations for stock *i* could be slower because the incorporation of information could be slower for firms with lower attention (from analysts). Hence, I analyze whether the coefficient of the interaction is significantly negative. Furthermore, to assess the interaction effect of analyst coverage of the highlighted stock *j*, I add the interactions of $N\_Cov_{j,t}$ in models (1) and (2). When the highlighted stock *j* is covered by more analysts ($N\_Cov_{j,t}$ is larger), the incorporation of cross-firm information could be slower because higher analysts' coverage of stock *j* (the highlighted stock) could result in a larger difference in analyst coverage (the speed of incorporating information) between the highlighted and related firm; hence, the interactions of analyst coverage of the highlighted stock ($N\_Cov_{j,t} * Rev\_TGT_{j,t}$) is positive.

Third, I analyze whether the lead-lag relationship is affected by the number of analysts who simultaneously mention the economic link. To this end, I define

$N\_Link_{i,j,t}$ as the number of analysts who mention the economic link between stock *j* and stock *i* (the highlighted and related stocks, respectively) on day *t*. I add the interaction of $N\_Link_{i,j,t}$ with the absolute value of the revision in target prices for the highlighted stock ($ABS\_Rev\_TGT_{j,t}$) and that with the revision in target prices ($Rev\_TGT_{j,t}$) to models (1) and (2), respectively.

Fourth, since the quality and quantity of cross-firm information could be different between star and non-star analysts, I analyze whether the lead-lag relationship is different between the economic link mentioned by star analysts and that by non-star analysts. I define $D\_STAR_{i,j,t}$ as the dummy variable that takes the value one when the link from stock *j* to stock *i* is mentioned by a star analyst on day *t*. Subsequently, I add the interaction of $D\_STAR_{i,j,t}$ with $ABS\_Rev\_TGT_{j,t}$ ($D\_STAR_{i,j,t} * ABS\_Rev\_TGT_{j,t}$) and that with $Rev\_TGT_{j,t}$ ($D\_STAR_{i,j,t} * Rev\_TGT_{j,t}$) in models (1) and (2), respectively. Because star analysts are expected to convey more influential cross-firm information, the coefficients of these interaction terms can be significantly positive.

Finally, I analyze whether earnings announcements affect the lead-lag relationship. When analysts issue research reports immediately after earnings announcements, these reports usually focus on providing supplemental information about the published earnings results. Since such information is (at least, partially) known to analysts and investors, a delay in information propagation is unlikely. To assess the influence of earnings announcements on the incorporation of cross-firm information, I define a dummy variable of an earnings announcement for the related and highlighted stocks ($D\_EA_{i,t}$ and $D\_EA_{j,t}$, respectively) as a dummy variable that takes the value of one if there is an earnings announcement for stocks *i* and *j* from day *t*-1 through *t*+1. I then

add the interaction of $D\_EA_{j,t}$ (a dummy variable of an earnings announcement for the highlighted stock) with $ABS\_Rev\_TGT_{j,t}$ ($D\_EA_{j,t}$ * $ABS\_Rev\_TGT_{j,t}$) and that with $Rev\_TGT_{j,t}$ ($D\_EA_{j,t}$ * $Rev\_TGT_{j,t}$) in models (1) and (2), respectively. In addition, I add the interaction of $D\_EA_{i,t}$ (a dummy variable of an earnings announcement for the related stock) with $ABS\_Rev\_TGT_{j,t}$ and that with $Rev\_TGT_{j,t}$ in models (1) and (2), respectively.

Table 7 shows the regression results for the interaction effect of the association between the updates of analysts' target prices for related stocks and the magnitude of lagged revisions in target prices for the highlighted stocks. Columns "SIZE (Highlighted)", "Analyst Coverage (Highlighted)", and "Star Analyst" reveal that (as shown in the row Interaction term) the coefficients of $SIZE_{j,t}$ * $ABS\_Rev\_TGT_{j,t}$ (the interaction with the market capitalization of the highlighted firm), $N\_Cov_{j,t}$ * $ABS\_Rev\_TGT_{j,t}$ (the interaction with analyst coverage of the highlighted firm), $D\_STAR_{i,j,t}$ * $ABS\_Rev\_TGT_{j,t}$ (the interaction with the star analyst status) are significantly positive; column "SIZE (Related)" shows the coefficients of $SIZE_{i,t}$ * $ABS\_Rev\_TGT_{j,t}$ (the interaction with the market capitalization of the related firm) are significantly negative. These results indicate that updates of analysts' target prices for the related stocks are influenced by revisions in their target prices for the highlighted stock, especially when the related stock is a smaller-cap one, the highlighted stock is a larger-cap one, and covered by more analysts, and the economic link is mentioned by star analysts. The direction of the coefficients is consistent with my prediction.

Table 8 shows the regression results for the interaction effect for the positive lead-lag relationship in analysts' target prices across economically linked stocks. The

columns “SIZE (Related)”, “Analyst coverage (Highlighted)”, and “Star Analyst” reveal that the coefficients of $N\_COV_{j,t} * Rev\_TGT_{j,t}$ (the interaction with analyst coverage of the highlighted firm) and $D\_STAR_{i,j,t} * Rev\_TGT_{j,t}$ (the interaction with the star analyst status) are significantly positive; the coefficient of $SIZE_{i,t} * Rev\_TGT_{j,t}$ (the interaction with the market capitalization of the related firm) is significantly negative. A positive lead-lag relationship in target prices can be observed, especially when the size of the related firm is a small-cap one; the highlighted stock is covered by more analysts, and the star analyst mentions the economic link. The direction of the coefficients is also consistent with my prediction.

[Tables 7 and 8]

4.2. The return predictability

I now analyze the impact when the return predictability associated with cross-firm information is pronounced. I analyze whether the association between stock returns for the related stock and lagged revisions in target prices for the highlighted stock is affected by firm size, analyst coverage, number of analysts who mention the economic link, whether the link is mentioned by a star analyst, and earnings announcements. I include the interaction of $SIZE_{i,t}$ and $SIZE_{j,t}$(log of market capitalizations of the related and highlighted stocks, respectively), $N\_Cov_{i,t}$ and $N\_Cov_{j,t}$(analyst coverage of the two stocks) $D\_STAR_{i,j,t}$ (the dummy variable of star analysts), $N\_Link_{i,j,t}$ (the number of analysts who mention the link), and $D\_EA_{i,t}$, and $D\_EA_{j,t}$ (the dummy variable of earnings announcement) in the regression model (3).

The regression results are presented in Table 9. Although the statistical significance of the regression result is weaker than that for the positive lead-lag relationship in

analysts' target prices (shown in Table 8), columns "Analyst coverage (Highlighted)" and "Star Analyst" reveal that the coefficients of $N\_Cov_{j,t} * Rev\_TGT_{j,t}$ (the interaction with analyst coverage of the highlighted firm) and $D\_STAR_{i,j,t} * Rev\_TGT_{j,t}$ (the interaction with the star analyst status) are significantly positive. Consistent with my predictions, stock prices are influenced by cross-firm information, especially when the highlighted stock is covered by more analysts, and star analysts mention the economic link. As shown in subsection 4.1., the positive lead-lag relationship in analysts' target prices is also pronounced under these conditions.

As I argued, when the highlighted stock is covered by more analysts, the delay in analysts' incorporation of cross-firm information into their expectation regarding the related stocks could be more substantial because of the larger difference in analysts' attention between the two stocks (the related and highlighted firms). In addition, the interaction effect regarding star analysts could indicate that a higher quality of cross-firm information strengthens the influence of cross-firm information, which could result in more significant return predictability. Hence, the results regarding the interaction effect are consistent with the information diffusion story.

[Table 9]

4.3 The lead-lag relationship for the same analyst

In this study, I analyze the economic links that include those for the same analyst as well as the links across different analysts as long as the both are employed by the same brokerage house. This is because cross-firm information is likely to be intensely shared between these analysts who are employed by the same brokerage house. Approximately 18% of my sample (economic links) are among different analysts.

However, in such cases, the speed of the gradual incorporation (information

sharing) of cross-firm information would be different. To test this possibility, I analyze whether the lead-lag relationship in target prices and the gradual incorporation of cross-firm information into prices of the related stocks are relevant to whether the highlighted and related stocks are covered by the same analyst.

To this end, I separate economic links into links based on whether the analyst who mentions the economic link covers the related stock. I denote $D\_Link\_Diff_{i,j,t}$ which takes the value of one if the two economically linked stocks (stocks *i* and *j*) are covered by different analysts (the analyst who mentions the economic link only covers the highlighted stock *j*). Subsequently, I add the interaction of $D\_Link\_Diff_{i,j,t}$ with $ABS\_Rev\_TGT_{j,t}$ ($D\_Link\_Diff_{i,j,t} * ABS\_Rev\_TGT_{j,t}$) in the regression model (1) to test whether the influence of cross-firm information on the update of target prices differs between both cases. Furthermore, I add the interaction of $D\_Link\_Diff_{i,j,t}$ with $Rev\_TGT_{j,t}$ in regression models (2) and (3) to analyze their influence on the positive lead-lag relationship in analysts' target prices and the impact on stock prices. If the coefficients of the interaction terms are significantly positive (negative), the lead-lag relationship and its price impact are stronger (weaker) if the analyst who mentions the economic link only covers the highlighted stock.

The results shown in Table 10 reveal that the coefficients of $D\_Link\_Diff_{i,j,t} * ABS\_Rev\_TGT_{j,t}$ and $D\_Link\_Diff_{i,j,t} * Rev\_TGT_{j,t}$ are not significantly associated with $D\_FwdRev\_TGT_{i,t}$ and $FwdRev\_TGT_{i,t}$, respectively. These insignificant interaction effects indicate that the lead-lag relationship in analysts' target prices is substantial, even if the analyst who mentions the economic link only covers the highlighted stock as long as the related firm is covered by another analyst employed by

the same brokerage house. Furthermore, $D\_Link\_Diff_{i,j,t} * Rev\_TGT_{j,t}$ is not significantly associated with $FwdRet_{i,t}$, showing that the return predictability associated with cross-firm information can be observed in such cases.

[Table 10]

6. Conclusion

This study empirically analyzes whether and how the cross-firm information in analysts' reports for the highlighted stock is gradually incorporated into their estimations for the related firms. To this end, I utilize the link mentioned by professional analysts because analysts carefully identify these links through detailed fundamental analyses. Specifically, I analyze whether the cross-firm information identified by revisions in analysts' estimates (target prices and earnings forecasts) for the highlighted stock influences their estimates and returns on the economically linked (related) stocks in a subsequent period.

I find that revisions in their target prices for the highlighted stocks induce subsequent revisions in their target prices for the related stocks. Specifically, their positive (negative) revisions in target prices induce positive (negative) revisions in related firms. Additionally, I find that these positive (negative) revisions induce higher (lower) subsequent returns on related stocks. The mediation analysis reveals that the return predictability associated with revisions in analysts' target prices for the highlighted stock is attributed to the lead-lag relationship in analysts' target prices. In summary, my findings provide evidence that the cross-firm information in analysts' reports is gradually incorporated into their estimates and stock prices of economically

linked firms.

Although analysts provide information about not only a highlighted stock but also related stocks, prior studies have rarely focused on the latter category. This study provides evidence of the informational value of the latter category. It also provides robust evidence for slow information diffusion across stocks. Prior studies analyze information diffusion without considering economic links or the diffusion across links, which are indirectly estimated using historical returns or microeconomic data. By contrast, I utilize the economic link identified by professional analysts through careful fundamental analysis. Thus, my evidence on slow information propagation through the more convincing link provides stronger proof of slow information diffusion across stocks.

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Table 1

Descriptive statistics and correlations: variables in the regression model (1)

Panels (a) and (b) report the descriptive statistics and correlations for regression model (1). The "Mean" row shows the average values. "Std. Dev." indicates standard deviation. "Median" shows the median values. "1st," "5th," "25th," "75th," "95th," and "99th" show 1st, 5th, 25th, 75th, 95th, and 99th percentiles, respectively. "Ratio(>0)," and "Ratio(=0)" show the ratio that the value is greater than zero, zero, respectively. Panel (b) shows the Pearson correlations between variables.

(a) Descriptive statistics

	Mean	Std. Dev.	Median	1st	5th	25th	75th	95th	99th	Pr(>0)	Pr(=0)
D_Fwd_Rev_EPS(Related)	0.246	0.431	0.000	0.000	0.000	0.000	0.000	1.000	1.000	0.246	0.754
D_Fwd_Rev_TGT(Related)	0.152	0.359	0.000	0.000	0.000	0.000	0.000	1.000	1.000	0.152	0.848
ABS_Rev_EPS(Related)	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.080	0.920
ABS_Rev_TGT(Related)	0.003	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.108	0.047	0.953
ABS_Rev_REC(Related)	0.003	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.996
ABS_Rev_EPS (Highlighted)	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.004	0.013	0.213	0.787
ABS_Rev_TGT (Highlighted)	0.011	0.036	0.000	0.000	0.000	0.000	0.000	0.094	0.207	0.132	0.868
ABS_Rev_REC (Highlighted)	0.013	0.114	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.013	0.987
ABS_Rev_ConEPS(Related)	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.386	0.614
ABS_Rev_ConTGT(Related)	0.004	0.010	0.000	0.000	0.000	0.000	0.002	0.023	0.060	0.306	0.694
ABS_Rev_ConREC(Related)	0.005	0.014	0.000	0.000	0.000	0.000	0.000	0.040	0.069	0.150	0.850
ABS_Rev_ConEPS (Highlighted)	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.004	0.011	0.555	0.445
ABS_Rev_ConTGT (Highlighted)	0.010	0.023	0.000	0.000	0.000	0.000	0.009	0.064	0.121	0.507	0.493
ABS_Rev_ConREC (Highlighted)	0.009	0.021	0.000	0.000	0.000	0.000	0.000	0.059	0.102	0.235	0.765
REC(Related)	0.447	0.617	1.000	-1.000	-1.000	0.000	1.000	1.000	1.000	-	-
ConREC(Related)	0.471	0.277	0.500	-0.250	0.000	0.289	0.676	0.875	1.000	-	-
ABS_PRet(Related)	0.066	0.082	0.045	0.001	0.004	0.021	0.085	0.194	0.367	-	-
SIZE(Related)	9.232	1.905	9.244	4.765	6.143	7.881	10.576	12.311	13.340	-	-
BP(Related)	0.410	0.287	0.336	0.017	0.056	0.184	0.575	1.000	1.000	-	-
ABS_SUE(Related)	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.087	0.913
ABS_SUE(Highlighted)	0.002	0.072	0.000	0.000	0.000	0.000	0.000	0.004	0.016	0.302	0.698

(b) Correlation

	ABS_Rev_TGT(Related)	ABS_Rev_EPS(Related)	ABS_Rev_TGT(Related)	ABS_Rev_REC(Related)	REC(Related)	ABS_Rev_EPS (Highlighted)	ABS_Rev_TGT (Highlighted)	ABS_Rev_REC (Highlighted)	SIZE(Related)	BP(Related)	ABS_Rev_ConEPS (Related)	ABS_Rev_ConTGT(Related)	ABS_Rev_ConREC(Related)	ConREC(Related)	ABS_Rev_ConEPS (Highlighted)	ABS_Rev_ConTGT (Highlighted)	ABS_PRet(Related)
ABS_Rev_EPS(Related)	0.469	0.1	-0.006	0.087	0.047	0.015	-0.051	0.082	0.519	0.371	0.149	-0.017	0.075	0.039	0.016	0.154	0.012
ABS_Rev_TGT(Related)		0.215	-0.009	0.045	0.1	0.076	-0.022	0.003	0.259	0.416	0.146	-0.004	0.031	0.047	0.012	0.066	0
ABS_Rev_REC(Related)			-0.018	0.009	0.033	0.07	-0.009	0.006	0.041	0.062	0.093	-0.016	0.004	0.008	0.01	0.013	0
REC(Related)				-0.007	-0.005	-0.007	0.145	-0.114	-0.026	-0.015	-0.017	0.521	-0.009	-0.001	-0.022	-0.009	-0.006
ABS_Rev_EPS (Highlighted)					0.428	0.105	-0.043	0.033	0.076	0.035	0.009	0.008	0.628	0.375	0.048	0.026	0.041
ABS_Rev_TGT (Highlighted)						0.286	-0.023	-0.046	0.018	0.035	0.007	0.025	0.287	0.517	0.02	0.006	0.006
ABS_Rev_REC (Highlighted)							-0.007	-0.009	-0.002	0.005	0.008	0.007	0.034	0.051	-0.009	-0.004	-0.001
SIZE(Related)								-0.24	-0.112	-0.065	-0.009	0.169	-0.075	-0.058	-0.161	-0.052	-0.028
BP(Related)									0.168	0.035	0.034	-0.19	0.081	-0.035	0.064	0.054	0.028
ABS_Rev_ConEPS(Related)										0.495	0.231	-0.043	0.134	0.053	0.107	0.205	0.017
ABS_Rev_ConTGT(Related)											0.362	-0.022	0.055	0.082	0.107	0.106	0.002
ABS_Rev_ConREC(Related)												-0.048	0.017	0.026	0.042	0.046	-0.003
ConREC(Related)													-0.006	0.012	-0.014	-0.019	-0.013
ABS_Rev_ConEPS (Highlighted)														0.485	0.079	0.043	0.067
ABS_Rev_ConTGT (Highlighted)															0.06	0.02	0.022
ABS_PRet(Related)																0.036	0.023
ABS_SUE(Related)																	0.009

Table 2

Influence on updates of analysts' estimates.

The table shows the estimation results of Equation (1): $D\_FwdRev_{i,t} = \alpha_0 + \beta_1 ABS\_Rev\_TGT_{j,t} + \beta_2 ABS\_Rev\_EPS_{j,t} + (Controls)$, for all economic links from stock j to stock i. The rows of "ABS_Rev_EPS(Highlighted)", "ABS_Rev_TGT(Highlighted)", "ABS_Rev_REC(Highlighted)" indicates coefficients of $ABS\_Rev\_EPS_{j,t}$, $ABS\_Rev\_TGT_{j,t}$, and $ABS\_Rev\_REC_{j,t}$, respectively. Similarly, the rows of "ABS_Rev_ConEPS(Highlighted)", "ABS_Rev_ConTGT(Highlighted)", "ABS_Rev_ConREC(Highlighted)" indicates coefficients of $ABS\_Rev\_ConEPS_{j,t}$, $ABS\_Rev\_ConTGT_{j,t}$, and $ABS\_Rev\_ConREC_{j,t}$, respectively; the rows of "REC (Highlighted)", "ConREC (Highlighted)", and "ABS_SUE(Highlighted)", indicate that of $REC_{i,t}$, $ConREC_{i,t}$, and $ABS\_SUE_{j,t}$, respectively. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	D_Fwd_Rev_TGT(Related)		D_Fwd_Rev_EPS(Related)	
ABS_Rev_EPS (Highlighted)	1.9560	(0.34)	12.1000 *	(2.53)
ABS_Rev_TGT (Highlighted)	1.7890 ***	(6.22)	0.4605	(1.82)
ABS_Rev_REC (Highlighted)	-0.2355 **	(2.74)	-0.2404 **	(3.28)
ABS_Rev_EPS(Related)	-306.3000 ***	(12.73)	-213.2000 ***	(12.31)
ABS_Rev_TGT(Related)	-8.8640 ***	(9.02)	-6.5160 ***	(8.55)
ABS_Rev_REC(Related)	-0.4612	(1.89)	-0.0076	(0.05)
ABS_Rev_ConEPS(Related)	37.8000 *	(2.24)	91.4400 ***	(6.48)
ABS_Rev_ConTGT(Related)	11.7100 ***	(10.32)	2.1930 *	(2.15)
ABS_Rev_ConREC(Related)	-1.4480 *	(2.06)	-1.8370 **	(3.08)
ABS_Rev_ConEPS (Highlighted)	-4.6080	(0.69)	4.5390	(0.81)
ABS_Rev_ConTGT (Highlighted)	1.9190 ***	(3.91)	1.0020 *	(2.34)
ABS_Rev_ConREC (Highlighted)	0.5142	(1.16)	0.3991	(1.06)
ConREC(Related)	0.0915 *	(2.27)	0.1629 ***	(4.81)
REC(Related)	-0.0032	(0.19)	0.0245	(1.69)
REC (Highlighted)	-0.0222	(1.29)	-0.0291 *	(2.01)
ConREC (Highlighted)	-0.1080 **	(2.73)	-0.0075	(0.23)
ABS_PRet(Related)	0.6512 ***	(5.50)	-0.1852	(1.71)
SIZE(Related)	-0.0121 *	(2.31)	0.0249 ***	(5.66)
BP(Related)	-0.0767 *	(2.27)	0.3758 ***	(13.55)
ABS_SUE(Related)	4.9440 **	(2.98)	5.1150 **	(3.02)
ABS_SUE(Highlighted)	-0.1606	(0.72)	-0.2482	(1.22)

Table 3
Descriptive statistics and correlations: variables in the regression model (2) and (3)

Panels (a) and (b) report the descriptive statistics and correlations of regression models (2) and (3), respectively. The "Mean" row shows the average values. "Std" shows the standard deviation. "Median" shows the median values. "1st," "5th," "25th," "75th," "95th," and "99th" show 1st, 5th, 25th, 75th, 95th, and 99th percentiles, respectively. "Ratio(>0)," and "Ratio(<0)" show the ratio that the value is greater and less than zero, respectively. Panel (b) shows the Pearson correlations between variables.

(a) Descriptive statistics

	Mean	Std. Dev.	Median	1st	5th	25th	75th	95th	99th	Pr(>0)	Pr(<0)
Fwd_Ret(Related)	0.003	0.096	0.002	-0.258	-0.131	-0.039	0.043	0.141	0.289	0.515	0.485
Fwd_Rev_TGT(Related)	0.004	0.041	0.000	-0.162	-0.017	0.000	0.000	0.070	0.221	0.097	0.055
Rev_EPS(Related)	0.000	0.001	0.000	-0.004	0.000	0.000	0.000	0.000	0.004	0.044	0.036
Rev_TGT(Related)	0.002	0.015	0.000	-0.047	0.000	0.000	0.000	0.000	0.108	0.032	0.015
Rev_REC(Related)	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002
Rev_EPS (Highlighted)	0.000	0.002	0.000	-0.013	-0.001	0.000	0.000	0.002	0.011	0.126	0.087
Rev_TGT (Highlighted)	0.004	0.038	0.000	-0.154	0.000	0.000	0.000	0.062	0.207	0.089	0.043
Rev_REC (Highlighted)	0.000	0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.007
Rev_ConEPS(Related)	0.000	0.001	0.000	-0.005	0.000	0.000	0.000	0.000	0.003	0.197	0.190
Rev_ConTGT(Related)	0.001	0.010	0.000	-0.040	-0.008	0.000	0.000	0.015	0.060	0.191	0.115
Rev_ConREC(Related)	0.000	0.015	0.000	-0.069	-0.020	0.000	0.000	0.019	0.065	0.074	0.075
Rev_ConEPS (Highlighted)	0.000	0.002	0.000	-0.011	-0.002	0.000	0.000	0.002	0.008	0.299	0.256
Rev_ConTGT (Highlighted)	0.003	0.025	0.000	-0.095	-0.021	0.000	0.003	0.044	0.121	0.324	0.183
Rev_ConREC (Highlighted)	0.000	0.023	0.000	-0.102	-0.036	0.000	0.000	0.036	0.088	0.118	0.117
REC(Related)	0.447	0.617	1.000	-1.000	-1.000	0.000	1.000	1.000	1.000	0.527	0.074
ConREC(Related)	0.471	0.277	0.500	-0.250	0.000	0.289	0.676	0.875	1.000	0.932	0.045
REC (Highlighted)	0.505	0.608	1.000	-1.000	-1.000	0.000	1.000	1.000	1.000	0.578	0.067
ConREC (Highlighted)	0.507	0.280	0.534	-0.233	0.000	0.333	0.712	0.938	1.000	0.945	0.040
SUE(Related)	0.000	0.010	0.000	-0.002	0.000	0.000	0.000	0.000	0.004	0.062	0.025
SUE(Highlighted)	-0.001	0.072	0.000	-0.008	-0.001	0.000	0.000	0.003	0.008	0.225	0.077

(b) Correlation

	ABS_Rev_TGT(Related)	ABS_Rev_REC(Related)	REC(Related)	ABS_Rev_EPS (Highlighted)	ABS_Rev_TGT (Highlighted)	ABS_Rev_REC (Highlighted)	SIZE(Related)	BP(Related)	ABS_Rev_ConEPS(Related)	ABS_Rev_ConTGT(Related)	ABS_Rev_ConREC(Related)	ConREC(Related)	ABS_Rev_ConEPS (Highlighted)	ABS_Rev_ConTGT (Highlighted)	ABS_PRet(Related)	ABS_SUE(Related)	SUE(Highlighted)
ABS_Rev_EPS(Related)	0.469	0.1	-0.006	0.087	0.047	0.015	-0.051	0.082	0.519	0.371	0.149	-0.017	0.075	0.039	0.016	0.154	0.012
ABS_Rev_TGT(Related)		0.215	-0.009	0.045	0.1	0.076	-0.022	0.003	0.259	0.416	0.146	-0.004	0.031	0.047	0.012	0.066	0
ABS_Rev_REC(Related)			-0.018	0.009	0.033	0.07	-0.009	0.006	0.041	0.062	0.093	-0.016	0.004	0.008	0.01	0.013	0
REC(Related)				-0.007	-0.005	-0.007	0.145	-0.114	-0.026	-0.015	-0.017	0.521	-0.009	-0.001	-0.022	-0.009	-0.006
ABS_Rev_EPS (Highlighted)					0.428	0.105	-0.043	0.033	0.076	0.035	0.009	0.008	0.628	0.375	0.048	0.026	0.041
ABS_Rev_TGT (Highlighted)						0.286	-0.023	-0.046	0.018	0.035	0.007	0.025	0.287	0.517	0.02	0.006	0.006
ABS_Rev_REC (Highlighted)							-0.007	-0.009	-0.002	0.005	0.008	0.007	0.034	0.051	-0.009	-0.004	-0.001
SIZE(Related)								-0.24	-0.112	-0.065	-0.009	0.169	-0.075	-0.058	-0.161	-0.052	-0.028
BP(Related)									0.168	0.035	0.034	-0.19	0.081	-0.035	0.064	0.054	0.028
ABS_Rev_ConEPS(Related)										0.495	0.231	-0.043	0.134	0.053	0.107	0.205	0.017
ABS_Rev_ConTGT(Related)											0.362	-0.022	0.055	0.082	0.107	0.106	0.002
ABS_Rev_ConREC(Related)												-0.048	0.017	0.026	0.042	0.046	-0.003
ConREC(Related)													-0.006	0.012	-0.014	-0.019	-0.013
ABS_Rev_ConEPS (Highlighted)														0.485	0.079	0.043	0.067
ABS_Rev_ConTGT (Highlighted)															0.06	0.02	0.022
ABS_PRet(Related)																0.036	0.023
ABS_SUE(Related)																	0.009

Table 4

Direction of the lead-lag relationship

The table shows the estimation results of Equation (2): $FwdRev\_TGT_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + (Controls)$, for all the economic links from stock j to stock i. The rows of "Rev_EPS (Highlighted)", "Rev_TGT (Highlighted)", and "Rev_REC(Highlighted)" indicate coefficients of $Rev\_EPS_{j,t}$, $Rev\_TGT_{j,t}$, and $Rev\_REC_{k,j,t}$, respectively. Similarly, the rows of "Rev_ConEPS (Highlighted)", "Rev_ConTGT (Highlighted)", "Rev_ConREC(Highlighted)" indicates coefficients of $Rev\_ConEPS_{j,t}$, $Rev\_ConTGT_{j,t}$, and $Rev\_ConREC_{j,t}$, respectively; the row "SUE(Highlighted)" indicates the coefficient of $SUE_{k,j,t}$. Standard errors are estimated using the cluster control at the firm. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	Fwd_Rev_TGT(Related)		
Rev_EPS (Highlighted)	-0.0870		(1.06)
Rev_TGT (Highlighted)	0.0269	***	(5.25)
Rev_REC (Highlighted)	-0.0006		(0.58)
Rev_EPS(Related)	-0.9046	***	(4.46)
Rev_TGT(Related)	-0.1467	***	(15.05)
Rev_REC(Related)	0.0048	***	(3.30)
Rev_ConEPS(Related)	1.2542	***	(4.24)
Rev_ConTGT(Related)	0.3548	***	(15.94)
Rev_ConREC(Related)	-0.0116		(1.20)
Rev_ConEPS (Highlighted)	0.1218		(1.26)
Rev_ConTGT (Highlighted)	0.0682	***	(7.62)
Rev_ConREC (Highlighted)	-0.0091		(1.41)
REC(Related)	-0.0014	***	(3.70)
ConREC(Related)	-0.0042	***	(3.65)
REC (Highlighted)	0.0007	*	(2.51)
ConREC (Highlighted)	-0.0016	*	(2.27)
PRet(Related)	0.0493	***	(21.03)
SIZE(Related)	0.0029	***	(5.92)
BP(Related)	0.0042	*	(2.28)
SUE(Related)	0.1428	*	(2.04)
SUE(Highlighted)	-0.0024		(1.03)
Controls for Firm Effects	Yes		
Adjusted R2	3.26%		

Table 5

The price impact of the lead-lag relationship

The table shows the estimation results of Equation (3): $FwdRet_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + (Controls)$, for all the economic links from stock j to stock i. Standard errors are estimated using the cluster control at the firm. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	Fwd_Ret(Related)	
Rev_EPS (Highlighted)	-0.6276 **	(3.28)
Rev_TGT (Highlighted)	0.0436 ***	(4.22)
Rev_REC (Highlighted)	-0.0025	(1.09)
Rev_EPS(Related)	-0.0521	(0.07)
Rev_TGT(Related)	0.0393	(1.52)
Rev_REC(Related)	0.0032	(0.68)
Rev_ConEPS(Related)	-0.4346	(0.55)
Rev_ConTGT(Related)	-0.0307	(0.67)
Rev_ConREC(Related)	0.0632 **	(2.87)
Rev_ConEPS (Highlighted)	-0.0690	(0.26)
Rev_ConTGT (Highlighted)	0.0256	(1.48)
Rev_ConREC (Highlighted)	-0.0110	(0.84)
REC(Related)	-0.0022 **	(2.83)
ConREC(Related)	0.0020	(0.64)
REC (Highlighted)	0.0004	(0.66)
ConREC (Highlighted)	0.0031	(1.90)
PRet(Related)	-0.0059	(0.90)
SIZE(Related)	-0.0165 ***	(10.18)
BP(Related)	0.0268 ***	(4.89)
SUE(Related)	0.2122	(0.75)
SUE(Highlighted)	0.0249 ***	(4.72)
Controls for Firm Effects	Yes	
Adjusted R2	1.50%	

Table 6

Mediation effects

The table shows the estimation results of Equation (4): $FwdRet_{i,t} = \alpha_0 + \beta_1 Rev\_TGT_{j,t} + \beta_2 FwdRev\_TGT_{i,t} + (Controls)$ for all economic links from stock j to stock i. Standard errors are estimated using the cluster control at the firm. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	Fwd_Ret(Related)	
Fwd_Rev_TGT(Related)	0.3622 ***	(25.11)
Rev_TGT (Highlighted)	0.0340 ***	(3.38)
Rev_EPS (Highlighted)	-0.6487 ***	(3.43)
Rev_REC (Highlighted)	-0.0020	(0.90)
Rev_EPS(Related)	0.3485	(0.48)
Rev_TGT(Related)	0.0913 ***	(3.49)
Rev_REC(Related)	0.0018	(0.39)
Rev_ConEPS(Related)	-0.9052	(1.13)
Rev_ConTGT(Related)	-0.1554 ***	(3.40)
Rev_ConREC(Related)	0.0661 **	(2.99)
Rev_ConEPS (Highlighted)	-0.1048	(0.39)
Rev_ConTGT (Highlighted)	0.0013	(0.07)
Rev_ConREC (Highlighted)	-0.0075	(0.58)
REC(Related)	-0.0016 *	(2.14)
ConREC(Related)	0.0027	(0.89)
REC (Highlighted)	0.0002	(0.36)
ConREC (Highlighted)	0.0038 *	(2.34)
PRet(Related)	-0.0234 ***	(3.70)
SIZE(Related)	-0.0178 ***	(10.81)
BP(Related)	0.0254 ***	(4.70)
SUE(Related)	0.1609	(0.61)
SUE(Highlighted)	0.0258 ***	(4.83)
Controls for Firm Effects	Yes	
Adjusted R2	4.28%	

Table 7

Interaction effect: Updates of analysts' estimates

The table shows the estimation results of Equation $D\_FwdRev_{i,t} = \alpha_0 + \beta_1(Interaction\ term) + \gamma_1 ABS\_Rev\_TGT_{j,t} + \gamma_2 ABS\_Rev\_EPS_{j,t} + (Controls)$ for all economic links from stock *j* to stock *i*. The columns of "SIZE(Highlighted)", "SIZE," "NCOV(Highlighted)", "NCOV," "Number of Reports," "Star Analyst, " Earnings Announcement," and "Earnings Announcement (Highlighted)" are regression results regarding the interaction with the firm size of stock *j* and stock *i*, the number of analyst following for stock *j* and stock *i*, the number of the report that mentions the link, whether the link is mentioned by star analysts, and whether there is an earnings announcement for stock *j* and stock *i*, respectively. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	SIZE (Highlighted)		SIZE(Related)		Analyst Coverage (Highlighted)		Analyst Coverage (Related)		Number of Reports		Star Analyst		Earnings Annoucement (Related)		Earnings Annoucement (Highlighted)	
Interaction term	0.71 ***	(5.70)	-0.42 ***	(3.58)	0.11 ***	(4.69)	-0.05	(1.96)	-0.05 *	(1.98)	1.45 ***	(3.45)	-0.80	(1.12)	-0.82	(1.59)
ABS_Rev_EPS(Related)	-305.10 ***	(12.68)	-307.40 ***	(12.78)	-306.50 ***	(12.73)	-306.40 ***	(12.74)	-307.50 ***	(12.77)	-304.80 ***	(12.68)	-303.80 ***	(12.60)	-305.30 ***	(12.70)
ABS_Rev_TGT(Related)	-9.07 ***	(9.23)	-8.87 ***	(9.02)	-8.96 ***	(9.11)	-8.88 ***	(9.03)	-8.81 ***	(8.95)	-8.98 ***	(9.13)	-8.80 ***	(8.94)	-8.93 ***	(9.08)
ABS_Rev_REC(Related)	-0.46	(1.88)	-0.46	(1.89)	-0.46	(1.87)	-0.46	(1.90)	-0.47	(1.91)	-0.46	(1.89)	-0.47	(1.91)	-0.46	(1.91)
ABS_Rev_EPS (Highlighted)	4.28	(0.75)	1.53	(0.27)	3.09	(0.54)	1.78	(0.31)	1.98	(0.35)	1.52	(0.27)	2.11	(0.37)	1.97	(0.34)
ABS_Rev_TGT (Highlighted)	-4.68 ***	(3.96)	5.69 ***	(5.07)	-0.03	(0.07)	2.62 ***	(5.15)	2.24 ***	(6.14)	0.99 **	(2.66)	1.87 ***	(6.32)	2.36 ***	(5.18)
ABS_Rev_REC (Highlighted)	-0.23 **	(2.65)	-0.23 **	(2.71)	-0.22 *	(2.53)	-0.24 **	(2.75)	-0.23 **	(2.68)	-0.23 **	(2.68)	-0.24 **	(2.77)	-0.27 **	(3.04)
ABS_Rev_ConEPS(Related)	35.84 *	(2.12)	38.51 *	(2.28)	36.24 *	(2.15)	38.32 *	(2.27)	37.91 *	(2.25)	37.07 *	(2.20)	38.37 *	(2.27)	37.58 *	(2.23)
ABS_Rev_ConTGT(Related)	11.76 ***	(10.37)	11.68 ***	(10.29)	11.75 ***	(10.35)	11.69 ***	(10.30)	11.68 ***	(10.29)	11.78 ***	(10.38)	11.85 ***	(10.38)	11.70 ***	(10.31)
ABS_Rev_ConREC(Related)	-1.43 *	(2.04)	-1.43 *	(2.04)	-1.44 *	(2.05)	-1.44 *	(2.05)	-1.45 *	(2.06)	-1.44 *	(2.05)	-1.46 *	(2.08)	-1.45 *	(2.07)
ABS_Rev_ConEPS (Highlighted)	-2.06	(0.31)	-4.80	(0.72)	-3.17	(0.48)	-4.66	(0.70)	-4.52	(0.68)	-4.99	(0.75)	-4.69	(0.71)	-4.27	(0.64)
ABS_Rev_ConTGT (Highlighted)	1.96 ***	(4.00)	1.88 ***	(3.81)	1.86 ***	(3.78)	1.93 ***	(3.93)	1.95 ***	(3.97)	2.05 ***	(4.16)	1.93 ***	(3.92)	2.12 ***	(4.19)
ABS_Rev_ConREC (Highlighted)	0.45	(1.02)	0.52	(1.18)	0.50	(1.12)	0.51	(1.16)	0.48	(1.07)	0.49	(1.09)	0.51	(1.15)	0.51	(1.15)
ConREC(Related)	0.10 *	(2.36)	0.09 *	(2.23)	0.10 *	(2.36)	0.09 *	(2.27)	0.09 *	(2.28)	0.09 *	(2.28)	0.09 *	(2.28)	0.09 *	(2.28)
REC(Related)	-0.00	(0.16)	-0.00	(0.14)	-0.00	(0.23)	-0.00	(0.14)	-0.00	(0.23)	-0.00	(0.12)	-0.00	(0.19)	-0.00	(0.18)
REC (Highlighted)	-0.02	(1.38)	-0.02	(1.31)	-0.02	(1.38)	-0.02	(1.28)	-0.02	(1.24)	-0.02	(1.23)	-0.02	(1.30)	-0.02	(1.31)
ConREC (Highlighted)	-0.12 **	(2.96)	-0.11 **	(2.71)	-0.11 **	(2.90)	-0.11 **	(2.74)	-0.11 **	(2.69)	-0.11 **	(2.78)	-0.11 **	(2.72)	-0.11 **	(2.68)
ABS_PRet(Related)	0.65 ***	(5.52)	0.65 ***	(5.49)	0.65 ***	(5.48)	0.65 ***	(5.52)	0.65 ***	(5.47)	0.65 ***	(5.52)	0.65 ***	(5.46)	0.64 ***	(5.43)
SIZE(Related)	-0.02 **	(2.88)	-0.01	(1.08)	-0.01 **	(2.63)	-0.01	(1.82)	-0.01 *	(2.38)	-0.01 *	(2.41)	-0.01 *	(2.31)	-0.01 *	(2.34)
BP(Related)	-0.08 *	(2.33)	-0.08 *	(2.26)	-0.08 *	(2.31)	-0.08 *	(2.26)	-0.08 *	(2.27)	-0.08 *	(2.36)	-0.08 *	(2.28)	-0.08 *	(2.29)
ABS_SUE(Related)	4.96 **	(2.99)	4.95 **	(2.98)	4.97 **	(3.00)	4.95 **	(2.98)	4.94 **	(2.98)	4.92 **	(2.97)	5.01 **	(3.02)	4.96 **	(2.99)
ABS_SUE(Highlighted)	-0.16	(0.74)	-0.16	(0.71)	-0.16	(0.72)	-0.16	(0.72)	-0.16	(0.73)	-0.16	(0.72)	-0.16	(0.72)	-0.16	(0.72)

Table 8

Interaction effect: Positive lead-lag relationship

The table shows the estimation results of Equation: $FwdRev_{k,i,t} = \alpha_0 + \beta_1(Interaction\ term) + \gamma_1 Rev\_TGT_{j,t} + (Controls)$ for all economic links from stock j to stock i. *, **, and *** indicate statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	SIZE (Highlighted)		SIZE(Related)		Analyst Coverage (Highlighted)		Analyst Coverage (Related)		Number of Reports		Star Analyst		Earnings Annoucement (Related)		Earnings Annoucement (Highlighted)	
Interaction term	0.01 *	(2.42)	-0.01 ***	(3.69)	0.00 **	(2.67)	-0.00	(1.61)	-0.00	(1.63)	0.04 ***	(4.30)	-0.03 *	(1.99)	-0.03 *	(2.55)
Rev_EPS(Related)	-0.90 ***	(4.43)	-0.90 ***	(4.45)	-0.90 ***	(4.45)	-0.91 ***	(4.50)	-0.90 ***	(4.44)	-0.89 ***	(4.42)	-0.90 ***	(4.43)	-0.89 ***	(4.41)
Rev_TGT(Related)	-0.15 ***	(15.18)	-0.15 ***	(15.05)	-0.15 ***	(15.13)	-0.15 ***	(14.96)	-0.15 ***	(14.97)	-0.15 ***	(15.21)	-0.15 ***	(14.88)	-0.15 ***	(15.11)
Rev_REC(Related)	0.00 ***	(3.36)	0.00 ***	(3.31)	0.00 ***	(3.37)	0.00 ***	(3.32)	0.00 ***	(3.33)	0.00 ***	(3.32)	0.00 **	(3.21)	0.00 **	(3.26)
Rev_EPS (Highlighted)	-0.09	(1.04)	-0.09	(1.03)	-0.09	(1.06)	-0.09	(1.06)	-0.09	(1.05)	-0.10	(1.25)	-0.08	(1.01)	-0.09	(1.04)
Rev_TGT (Highlighted)	-0.03	(1.23)	0.10 ***	(4.62)	0.00	(0.13)	0.03 ***	(4.94)	0.03 ***	(4.97)	0.01	(0.86)	0.03 ***	(5.57)	0.04 ***	(5.24)
Rev_REC (Highlighted)	-0.00	(0.64)	-0.00	(0.57)	-0.00	(0.53)	-0.00	(0.49)	-0.00	(0.51)	-0.00	(0.78)	-0.00	(0.65)	-0.00	(1.25)
Rev_ConEPS(Related)	1.24 ***	(4.21)	1.26 ***	(4.24)	1.25 ***	(4.23)	1.25 ***	(4.24)	1.24 ***	(4.18)	1.25 ***	(4.24)	1.25 ***	(4.22)	1.25 ***	(4.23)
Rev_ConTGT(Related)	0.36 ***	(15.96)	0.35 ***	(15.91)	0.35 ***	(15.94)	0.35 ***	(15.91)	0.36 ***	(15.96)	0.36 ***	(16.01)	0.36 ***	(16.04)	0.35 ***	(15.94)
Rev_ConREC(Related)	-0.01	(1.19)	-0.01	(1.20)	-0.01	(1.19)	-0.01	(1.20)	-0.01	(1.21)	-0.01	(1.19)	-0.01	(1.25)	-0.01	(1.21)
Rev_ConEPS (Highlighted)	0.13	(1.32)	0.12	(1.20)	0.13	(1.30)	0.12	(1.27)	0.12	(1.19)	0.12	(1.20)	0.12	(1.24)	0.13	(1.29)
Rev_ConTGT (Highlighted)	0.07 ***	(7.67)	0.07 ***	(7.53)	0.07 ***	(7.48)	0.07 ***	(7.64)	0.07 ***	(7.66)	0.07 ***	(7.97)	0.07 ***	(7.64)	0.07 ***	(8.07)
Rev_ConREC (Highlighted)	-0.01	(1.42)	-0.01	(1.38)	-0.01	(1.46)	-0.01	(1.44)	-0.01	(1.44)	-0.01	(1.46)	-0.01	(1.40)	-0.01	(1.50)
REC(Related)	-0.00 ***	(3.70)	-0.00 ***	(3.68)	-0.00 ***	(3.70)	-0.00 ***	(3.71)	-0.00 ***	(3.76)	-0.00 ***	(3.69)	-0.00 ***	(3.70)	-0.00 ***	(3.72)
ConREC(Related)	-0.00 ***	(3.63)	-0.00 ***	(3.64)	-0.00 ***	(3.64)	-0.00 ***	(3.66)	-0.00 ***	(3.83)	-0.00 ***	(3.65)	-0.00 ***	(3.64)	-0.00 ***	(3.63)
REC (Highlighted)	0.00 *	(2.48)	0.00 *	(2.49)	0.00 *	(2.47)	0.00 *	(2.56)	0.00 **	(2.59)	0.00 *	(2.53)	0.00 *	(2.50)	0.00 *	(2.45)
ConREC (Highlighted)	-0.00 *	(2.28)	-0.00 *	(2.24)	-0.00 *	(2.29)	-0.00 *	(2.27)	-0.00 *	(2.32)	-0.00 *	(2.35)	-0.00 *	(2.26)	-0.00 *	(2.24)
PRet(Related)	0.05 ***	(21.01)	0.05 ***	(21.05)	0.05 ***	(21.06)	0.05 ***	(21.02)	0.05 ***	(21.43)	0.05 ***	(21.00)	0.05 ***	(21.02)	0.05 ***	(20.97)
SIZE(Related)	0.00 ***	(5.88)	0.00 ***	(6.02)	0.00 ***	(5.91)	0.00 ***	(5.93)	0.00 ***	(5.66)	0.00 ***	(5.90)	0.00 ***	(5.90)	0.00 ***	(5.88)
BP(Related)	0.00 *	(2.31)	0.00 *	(2.29)	0.00 *	(2.29)	0.00 *	(2.28)	0.00	(1.38)	0.00 *	(2.28)	0.00 *	(2.27)	0.00 *	(2.29)
SUE(Related)	0.14 *	(2.04)	0.14 *	(2.03)	0.14 *	(2.05)	0.14 *	(2.04)	0.14 *	(2.05)	0.14 *	(2.03)	0.14 *	(2.06)	0.14 *	(2.05)
SUE(Highlighted)	-0.00	(1.00)	-0.00	(1.05)	-0.00	(0.99)	-0.00	(1.03)	-0.00	(1.03)	-0.00	(1.06)	-0.00	(1.03)	-0.00	(1.03)

Table 9

Interaction effect: The price impact

The table shows the estimation results of Equation: $FwdRet_{i,t} = \alpha_0 + \beta_1(Interaction\ term) + \gamma_1 Rev\_TGT_{j,t} + (Controls)$ for all economic links from stock j to stock i. *, **, and *** indicate statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

	SIZE (Highlighted)		SIZE(Related)		Analyst Coverage (Highlighted)		Analyst Coverage (Related)		Number of Reports		Star Analyst		Earnings Annoucement (Related)		Earnings Annoucement (Highlighted)	
Interaction term	0.01	(1.21)	-0.01	(1.71)	0.00 **	(2.96)	0.00 *	(2.22)	0.00	(1.36)	0.04 **	(2.75)	0.03	(0.97)	0.03	(1.66)
Rev_EPS(Related)	-0.05	(0.06)	-0.05	(0.07)	-0.05	(0.06)	-0.05	(0.07)	-0.04	(0.06)	-0.04	(0.06)	-0.06	(0.08)	-0.07	(0.09)
Rev_TGT(Related)	0.04	(1.48)	0.04	(1.52)	0.04	(1.46)	0.04	(1.52)	0.04	(1.49)	0.04	(1.45)	0.04	(1.47)	0.04	(1.60)
Rev_REC(Related)	0.00	(0.69)	0.00	(0.68)	0.00	(0.72)	0.00	(0.68)	0.00	(0.67)	0.00	(0.68)	0.00	(0.71)	0.00	(0.69)
Rev_EPS (Highlighted)	-0.63 **	(3.28)	-0.63 **	(3.27)	-0.63 **	(3.29)	-0.63 ***	(3.30)	-0.63 **	(3.28)	-0.64 ***	(3.36)	-0.63 ***	(3.30)	-0.63 **	(3.29)
Rev_TGT (Highlighted)	-0.01	(0.19)	0.13 *	(2.33)	-0.01	(0.41)	0.00	(0.12)	0.03 **	(2.60)	0.02	(1.55)	0.04 ***	(4.07)	0.02	(1.59)
Rev_REC (Highlighted)	-0.00	(1.11)	-0.00	(1.08)	-0.00	(1.04)	-0.00	(1.02)	-0.00	(1.15)	-0.00	(1.19)	-0.00	(1.06)	-0.00	(0.67)
Rev_ConEPS(Related)	-0.44	(0.56)	-0.43	(0.55)	-0.44	(0.56)	-0.44	(0.55)	-0.43	(0.55)	-0.44	(0.55)	-0.43	(0.54)	-0.43	(0.54)
Rev_ConTGT(Related)	-0.03	(0.66)	-0.03	(0.68)	-0.03	(0.66)	-0.03	(0.66)	-0.03	(0.65)	-0.03	(0.65)	-0.03	(0.73)	-0.03	(0.67)
Rev_ConREC(Related)	0.06 **	(2.87)	0.06 **	(2.87)	0.06 **	(2.88)	0.06 **	(2.87)	0.06 **	(2.86)	0.06 **	(2.88)	0.06 **	(2.89)	0.06 **	(2.87)
Rev_ConEPS (Highlighted)	-0.06	(0.24)	-0.08	(0.28)	-0.06	(0.23)	-0.07	(0.26)	-0.07	(0.27)	-0.08	(0.29)	-0.07	(0.26)	-0.07	(0.28)
Rev_ConTGT (Highlighted)	0.03	(1.51)	0.02	(1.41)	0.02	(1.39)	0.03	(1.47)	0.03	(1.46)	0.03	(1.67)	0.03	(1.46)	0.02	(1.05)
Rev_ConREC (Highlighted)	-0.01	(0.85)	-0.01	(0.83)	-0.01	(0.89)	-0.01	(0.85)	-0.01	(0.82)	-0.01	(0.87)	-0.01	(0.85)	-0.01	(0.79)
REC(Related)	-0.00 **	(2.83)	-0.00 **	(2.82)	-0.00 **	(2.83)	-0.00 **	(2.84)	-0.00 **	(2.83)	-0.00 **	(2.83)	-0.00 **	(2.83)	-0.00 **	(2.82)
ConREC(Related)	0.00	(0.64)	0.00	(0.64)	0.00	(0.64)	0.00	(0.62)	0.00	(0.64)	0.00	(0.64)	0.00	(0.63)	0.00	(0.62)
REC (Highlighted)	0.00	(0.65)	0.00	(0.65)	0.00	(0.62)	0.00	(0.68)	0.00	(0.62)	0.00	(0.67)	0.00	(0.67)	0.00	(0.70)
ConREC (Highlighted)	0.00	(1.89)	0.00	(1.91)	0.00	(1.87)	0.00	(1.89)	0.00	(1.90)	0.00	(1.86)	0.00	(1.89)	0.00	(1.88)
PRet(Related)	-0.01	(0.90)	-0.01	(0.91)	-0.01	(0.91)	-0.01	(0.90)	-0.01	(0.88)	-0.01	(0.92)	-0.01	(0.90)	-0.01	(0.88)
SIZE(Related)	-0.02 ***	(10.18)	-0.02 ***	(10.13)	-0.02 ***	(10.18)	-0.02 ***	(10.20)	-0.02 ***	(10.18)	-0.02 ***	(10.20)	-0.02 ***	(10.17)	-0.02 ***	(10.17)
BP(Related)	0.03 ***	(4.90)	0.03 ***	(4.89)	0.03 ***	(4.89)	0.03 ***	(4.88)	0.03 ***	(4.89)	0.03 ***	(4.89)	0.03 ***	(4.89)	0.03 ***	(4.89)
SUE(Related)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)	0.21	(0.75)
SUE(Highlighted)	0.03 ***	(4.73)	0.02 ***	(4.70)	0.03 ***	(4.75)	0.03 ***	(4.73)	0.02 ***	(4.72)	0.02 ***	(4.70)	0.02 ***	(4.72)	0.02 ***	(4.72)

Table 10

The link between different analysts

Panel (a) shows the estimation results for the update of analysts' estimates. Panel (b) shows the estimation results for the positive lead-lag relationship and its price impact. *, **, and *** indicate the statistical significance at the 0.05, 0.01, and 0.001 levels, respectively.

(a) Update of analysts' estimates

	D_Fwd_Rev_TGT(Related)		
Interaction term	-0.8153		(1.52)
D_Link_Diff	-0.0656	**	(2.94)
ABS_Rev_TGT (Highlighted)	1.9470	***	(6.29)
ABS_Rev_EPS(Related)	-305.9000	***	(12.71)
ABS_Rev_TGT(Related)	-8.9200	***	(9.07)
ABS_Rev_REC(Related)	-0.4575		(1.88)
ABS_Rev_EPS (Highlighted)	1.9260		(0.34)
ABS_Rev_REC (Highlighted)	-0.2296	**	(2.67)
ABS_Rev_ConEPS(Related)	38.6200	*	(2.29)
ABS_Rev_ConTGT(Related)	11.7600	***	(10.37)
ABS_Rev_ConREC(Related)	-1.4610	*	(2.08)
ABS_Rev_ConEPS (Highlighted)	-4.4070		(0.66)
ABS_Rev_ConTGT (Highlighted)	1.9150	***	(3.90)
ABS_Rev_ConREC (Highlighted)	0.4998		(1.13)
ConREC(Related)	0.0948	*	(2.34)
REC(Related)	-0.0025		(0.14)
REC (Highlighted)	-0.0210		(1.22)
ConREC (Highlighted)	-0.1060	**	(2.68)
ABS_PRet(Related)	0.6585	***	(5.56)
SIZE(Related)	-0.0093		(1.75)
BP(Related)	-0.0758	*	(2.24)
ABS_SUE(Related)	4.9770	**	(3.00)
ABS_SUE(Highlighted)	-0.1636		(0.73)

(b) Positive lead-lag relationship and its positive price impacts

	Fwd_Rev(Related)		Fwd_Ret(Related)	
Interaction term	0.0175	(0.98)	-0.0052	(0.47)
Rev_TGT (Highlighted)	0.0396 ***	(3.47)	0.0280 ***	(5.05)
D_Link_Diff	0.0000	(0.01)	-0.0006	(1.69)
Rev_EPS(Related)	-0.0558	(0.08)	-0.9053 ***	(4.47)
Rev_TGT(Related)	0.0397	(1.54)	-0.1469 ***	(15.07)
Rev_REC(Related)	0.0031	(0.66)	0.0048 ***	(3.31)
Rev_EPS (Highlighted)	-0.6287 **	(3.29)	-0.0885	(1.07)
Rev_REC (Highlighted)	-0.0025	(1.08)	-0.0006	(0.58)
Rev_ConEPS(Related)	-0.4361	(0.55)	1.2543 ***	(4.24)
Rev_ConTGT(Related)	-0.0306	(0.67)	0.3549 ***	(15.94)
Rev_ConREC(Related)	0.0631 **	(2.87)	-0.0116	(1.21)
Rev_ConEPS (Highlighted)	-0.0715	(0.27)	0.1219	(1.26)
Rev_ConTGT (Highlighted)	0.0258	(1.49)	0.0682 ***	(7.62)
Rev_ConREC (Highlighted)	-0.0110	(0.84)	-0.0091	(1.41)
REC(Related)	-0.0022 **	(2.83)	-0.0014 ***	(3.71)
ConREC(Related)	0.0020	(0.63)	-0.0042 ***	(3.64)
REC (Highlighted)	0.0004	(0.66)	0.0007 *	(2.53)
ConREC (Highlighted)	0.0032	(1.90)	-0.0016 *	(2.24)
PRet(Related)	-0.0058	(0.90)	0.0492 ***	(21.03)
SIZE(Related)	-0.0165 ***	(10.19)	0.0029 ***	(5.96)
BP(Related)	0.0268 ***	(4.89)	0.0042 *	(2.29)
Controls for Firm Effects	Yes		Yes	
Adjusted R2	3.26%		1.50%	

Appendix: Control Variable Definitions

Variables	Definition
$D\_FwdRev\_TGT_{i,t}$	A dummy variable that equals one if there are any revisions in analysts' target price for stock *i* for days *t*+2 through *t*+10
$D\_FwdRev\_EPS_{i,t}$	A dummy variable that equals one if there are any revisions in analysts' earnings forecast (FY1) for stock *i* for days *t*+2 through *t*+10
$FwdRev\_TGT_{i,t}$	Change ratio of analysts' target prices for stock *j* for days *t*+2 through *t*+10
$Rev\_TGT_{i,t}$	Change ratio of analysts' target prices for stock *i* for days *t* through *t*+1
$Rev\_EPS_{i,t}$	A change in analysts' earnings per share for stock *i* deflated by stock *i*'s price (as of *t*) for days *t* through *t*+1
$Rev\_REC_{i,t}$	A change in analysts' stock recommendation for stock *i* for days *t* through *t*+1, where the recommendation is coded as: Strong buy =2, Buy=1, Hold=0, Sell=-1, Strong sell=-2.
$ABS\_Rev\_TGT_{i,t}$	Absolute value of $Rev\_TGT_{i,t}$
$ABS\_Rev\_EPS_{i,t}$	Absolute value of $Rev\_EPS_{i,t}$
$ABS\_Rev\_REC_{i,t}$	Absolute value of $Rev\_REC_{i,t}$
$Rev\_ConTGT_{i,t}$	Change ratio of analysts' average target prices (except for analysts that mention the link) for stock *i* for days *t* through *t*+1
$Rev\_ConEPS_{i,t}$	A change in analysts' average EPS (except for analysts that mention the link) for stock *i* deflated by stock *i*'s price (as of *t*) for days *t* through *t*+1
$Rev\_ConREC_{i,t}$	A change in analysts' average recommendations (except for analysts that mention the link) for stock *i* for days *t* through *t*+1
$ABS\_Rev\_ConTGT_{i,t}$	Absolute value of $Rev\_ConTGT_{i,t}$
$ABS\_Rev\_ConEPS_{i,t}$	Absolute value of $Rev\_ConEPS_{i,t}$
$ABS\_Rev\_ConREC_{i,t}$	Absolute value of $Rev\_ConREC_{i,t}$
$REC_{i,t}$	Analysts' stock recommendation for stock *i* at days *t,* coded as Strong buy =2, Buy=1, Hold=0, Sell=-1, Strong sell=-2.
$ConREC_{i,t}$	Analysts' average recommendations (except for analysts that mention the link) for stock *i* at days *t*
$PRET_{i,t}$	An abnormal return for day *t*-10 through day *t*-1, where abnormal returns are calculated based on the Carhart four-factor model.
$ABS\_PRET_{i,t}$	Absolute value of $PRET_{i,t}$
$SUE_{i,t}$	A difference between consensus forecasts for the most recent reported quarterly EPS for stock *i* and the corresponding reported (actual) EPS denominated by a stock price if there is an earnings announcement from day *t*-1 through *t*+1 (otherwise

	zero).
$ABS\_SUE_{i,t}$	Absolute value of $SUE_{i,t}$
$SIZE_{i,t}$	Log of the market value of equity of stock *i* at day *t*
$BM_{i,t}$	Book-to-market ratio (book value of equity/market value of equity) of stock *i* at day *t*