Does Short-term Non-fundamental Mispricing Affect the Economy?

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ABSTRACT

I examine the real economic effects of short-term non-fundamental mispricing. To measure short-term mispricing, for two paired firms sharing a confusing ticker, extreme price movements of the big firm trigger the ticker-confusing trading, which results in non-fundamental price movements in the small firms. I find those mispricing shocks do attract insider trading and change a firm's use of internal capital markets. However, they do not impact a firm's use of external capital markets and its long-term investment behavior. The results suggest short-term mispricing shocks have limited economic effects.

Keywords: Non-fundamental price movements, Real effects, Ticker confusion

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I. Introduction

The stock price on the secondary market aggregates information from various market participants, thus providing firm managers an important signal about how the market values the firm (Bond, Edmans, & Goldstein, 2012). When firm managers believe that investors are informed, they would actively learn from stock prices to acquire incremental information in making real decisions (e.g., Luo, 2005; Chen, Goldstein, & Jiang, 2007). However, driven by sentiment and liquidity shocks, stock prices in the short term can be noisy. A number of papers examine short-term price efficiency[1], yet it is unclear whether deviations from short-term efficiency matter, especially for a firm's real behavior.

Empirically, it is challenging to identify those non-fundamental movements as they need to satisfy two requirements: observable to econometricians and orthogonal to the firm's fundamentals (Wardlaw, 2020). Depending on the duration of non-fundamental mispricing shock, it can be classified as either long-term or short-term. Previous literature mainly focuses on long-term mispricing. For example, the mutual fund flow-induced price pressure identified by Edmans, Goldstein, and Jiang (2012) takes two years on average to fully reverse. This paper focuses on the real effects of short-term non-fundamental price movements, which is an unexplored topic in the existing literature. The price pressure identified in this paper only persists for a few days. And the magnitude of those price movements is comparable to that of the Edmans et al. (2012) measure.

Examining the manager's response to short-term non-fundamental price movements is important for the following three reasons. First, it helps understand the extent to which price inefficiency affects real inefficiency in the short term. Whether managers behave differently when compared to that in the long term. If so, is it because managers do not have time

[1]See, for example, Hasbrouck (1993), Hou and Moskowitz (2005), and Boehmer and Kelley (2009).

to react in response to short-term mispricing, or do they just treat it as noise? Second, it has important policy implications on short-term price efficiency. Whether managers can distinguish between fundamental and non-fundamental price movements in the short term. If so, do insiders take advantage of this trading opportunity? Third, it helps reveal how managers communicate with the market regarding large price movements in the short term. Whether managers strategically change the firm news disclosure in order to manage the expectation of investors. If so, does this strategy help stabilize the stock price? Many previous studies use the Edmans et al. (2012) methodology and examine various real economic outcomes of non-fundamental stock price movements[2]. The main focus of this paper is to look at whether those results still hold in the short term.

The primary challenge to examining the relationship between short-term mispricing shocks and real economic outcomes is that these variables may be jointly determined. In other words, mispricing shocks may respond to a firm's behavior, and/or a firm's behavior may respond to secondary mispricing shocks. Moreover, it is also possible that an omitted variable jointly affects both short-term mispricing and the firm's fundamentals. As a result, there is concern about reverse causality, omitted variable bias, and simultaneity bias in this setting. I use the event of the existence of ticker-confusing trading to design an identification strategy to address these concerns.

To identify short-term non-fundamental mispricing shock, I develop a novel strategy that uses the confusing trading behavior on stocks with similar tickers or names. Specifically, for two firms in a confusing ticker part, I capture non-fundamental price movements of the

[2]See, for example, Derrien, Kecskés, and Thesmar (2013) on payout policy, Phillips and Zhdanov (2013) on R&D expenditures, Norli, Ostergaard, and Schindele (2015) on shareholder activism, Zuo (2016) on managerial earnings forecasts, Lee and So (2017) on changes in analyst coverage, Bonaime, Gulen, and Ion (2018) on mergers and acquisitions, Eckbo, Makaew, and Thorburn (2018) on stock-financed takeovers, and Lou and Wang (2018) and Dessaint, Foucault, Frésard, and Matray (2018) on corporate investment.

small firm induced by ticker-confusing trading activity around extreme price movements of the big firm that has a similar ticker or name to the small firm. Big firm and small firm are defined according to their market capitalization. For example, consider two firms, Zoom Video Communications Inc. (Ticker: ZM) and ZOOM Technologies, Inc. (Ticker: ZOOM). In 2020, after the outbreak of COVID-19, Zoom Video became the main virtual meeting tool for companies and universities. At the same time, it also gained popularity in the stock market. A lot of investors rushed in and bought its stock. At the same time, ZOOM Tech was also traded in the market with its ticker exactly the same as the name of Zoom Video. Investors easily got confused with these two stocks. Suppose there is a large price movement happening on the stock of Zoom Video for either fundamental or non-fundamental reasons; investors may trade on the stocks of both Zoom Video and ZOOM Tech because of the existence of ticker confusion (Rashes, 2001; Balashov & Nikiforov, 2019). Therefore, if ZOOM Tech is also experiencing a price movement without any fundamental news, then this price movement would be non-fundamental to the management of ZOOM Tech.

After identifying those short-term non-fundamental mispricing shocks, the main focus of this paper is to look at how managers respond to those shocks. Existing theories on the roles of stock prices have implications on how non-informative trading can influence a firm's investment decision. The first channel is the managerial learning channel. To the extent that firm managers cannot distinguish between fundamental and non-fundamental price movements, ticker-confusion-induced trading can prompt firm managers to adjust investments. Under this channel, investment decisions in firms with more informed stock prices or managers with less private information are more sensitive to price movements (Chen et al., 2007). The second channel is the financing channel. Ticker-confusion-induced trading can affect investment through its impact on the cost of capital, and the effect will be stronger for those

with financial constraints (Baker, Stein, & Wurgler, 2003).

The paper also plans to look at other managers' behaviors that are observable in the short term, such as announcements and news disclosure. Henning, Oesch, and Schmid (2015) find that managers appear to be aware of the undervaluation resulting from mutual fund flow-induced selling pressure and thus respond by delaying the release of bad news while speeding up the publication of good news. However, it remains unexplored about the effectiveness of this disclosure strategy and if there are any other forms of communication between managers and relevant stakeholders after the short-term non-fundamental mispricing shock.

Overall, this paper has a number of contributions. First, this paper is part of a large and growing literature on the roles of non-fundamental price movements in shaping real economic activity. While most of the existing studies rely on long-term non-fundamental price movements identified using the EGJ methodology, I add to the literature by studying short-term non-fundamental price movements that only persist for a few days. Therefore, this paper helps us understand how managers make different real decisions under different horizons.

Second, I extend the possible usage of ticker confusion in real effects research. Balashov and Nikiforov (2019) use the US stock market data from 1993 to 2013 and find that about 5% of the annual trading volume of the firms mistakenly bought was down to confusion. A similar story was still happening recently. For example, an Australian mining firm, GME Resources Ltd., saw a spike in trades during the short squeeze of GameStop. What's more, when Elon Musk's tweets mentioned a firm (e.g., Signal Technology Foundation, Clubhouse), other unrelated firms with similar ticker or name would experience large price movements. These large stock price movements are exogenous to firms that have ticker confusion issues, and thus can potentially be used in many fields related to how secondary stock price affects

the real economy.

The remainder of this paper is organized as follows: Section II describes hypothesis development. Section III describes the data and variables. Section IV presents the current empirical results. Section V concludes the paper.

II. Hypothesis Development

For short-term non-fundamental price movements to have an effect on a firm's real behavior, there are two channels: the managerial learning channel and the financing channel. In the first place, managers need to identify whether those price movements are driven by fundamental news or non-fundamental reasons (e.g., sentiment and liquidity). Then, managers decide whether to take advantage of those price movements by either learning the new information conveyed by the market or changing their financing decisions. Last, managers may change their investment decisions correspondingly.

Under the managerial learning channel, managers' real decisions are indirectly affected by large price movements because they cannot tell price movements induced by ticker-confusing trading activity from fundamental price movements. Thus, they believe that stock price movement may contain valuable private information from informed investors in the market. And they may change their investment decisions after learning this new information. If this is the case, they will act like momentum traders by buying high and selling low because they think stock price changes due to fundamentals. In contrast, if managers know that those price movements are not related to fundamentals, they could trade against the tide and act like contrarian traders by buying low and selling high, as those mispricing shocks are transient. To sum up, I develop the following hypothesis.

Hypothesis 1: Under the managerial learning channel, if short-term non-fundamental price movements matter for managers' real decisions, insider trading would be positively related to the direction of price movement.

Under the financing channel, stock price affects investment through its impact on the cost of capital. Warusawitharana and Whited (2016) used structural estimation and developed a neoclassical dynamic investment model in which firms finance with equity, debt, and cash. Equity financing is costly, but the firm can also accumulate cash and issue debt. In the presence of non-fundamental mispricing shocks in equity prices, firms still naturally issue more equity in response to overvaluation and repurchase more shares in response to undervaluation. To sum up, I develop the following hypothesis.

Hypothesis 2: Under the financing channel, if short-term non-fundamental price movements matter for managers' real decisions, managers would increase equity issuance after positive mispricing shock and increase share repurchase after negative mispricing shock.

Overall, testing the two hypotheses above helps answer an important question: do managers time the market in the short term? When facing short-term price movements, are managers able to distinguish fundamental shocks from non-fundamental shocks? If so, do they have enough time to act on those short-lived opportunities by either making insider trading or changing the firm's capital structure?

III. Methodology

To examine how managers respond to short-term non-fundamental price movements, I combine data from the NYSE Trade and Quote (TAQ) database, the Center for Research in Security Prices (CRSP), and the ticker confusion database from Balashov and Nikiforov

(2019), as discussed below. I then use the high-frequency data from TAQ to develop an identification strategy that captures short-term non-fundamental mispricing shocks of the focal firm induced by ticker-confusing trading activity around extreme price movements (EPMs) of the paired firm that has a similar ticker or name to the focal firm.

A. Data

High-frequency data, such as stock intraday trading price and volume, come from TAQ. With the TAQ Consolidated Trades data, I first extract each stock's 10-minute interval prices at 38 interval times ($P_{9:40}, P_{9:50}, P_{10:00}, ..., P_{15:30}, P_{15:40}, P_{15:50}$). I exclude the first (9:30 - 9:40) and last (15:50 - 16:00) intervals from regular trading hours to alleviate opening and closing effects. Interval prices are formed using the nearest volume-weighted average price in each second within ± 5 minutes of interval times. Also, I exclude stock-days with more than 10% of consecutive missing interval prices on a specific trading day to alleviate the liquidity effect. Interval returns are then calculated using interval prices. In addition, I also calculate interval turnovers as the total trading volume in each 10-minute interval divided by shares outstanding on that day. For the proxy of market return and turnover, I use the SPDR Standard & Poor's (S&P) 500 exchange-traded fund (ETF) Trust (SPY).

Ticker confusion data come from Balashov and Nikiforov (2019). They use five types of possible similarities between the tickers and names of firms. The first and second types include pairs for which the ticker of the first firm is part of the name of the second firm and/or the ticker of the second firm is part of the name of the first firm (e.g., Witco Chemical Corp. (WIT) and Wit Capital Group Inc. (WITC)). The third type includes pairs for which the ticker of one company is the ticker of another company plus an extra letter or two. And both firms' tickers should contain at least three letters and share parts of their names (e.g.,

MassMutual Corporate Investors Inc. (MCI) and MCI Communications Corp. (MCIC)). The fourth type includes pairs for which the ticker of one firm is the ticker of another firm, with the last two letters switched. And both firms' tickers should contain at least four letters (e.g., Victoria Bankshares Inc. (VICT) and Victoria Creations Inc. (VITC)). The fifth type includes remaining unidentified pairs that are shown in media for news (e.g., Newell Brands Inc. (NWL, the owner of the Graco brand) and Graco Inc. (GGG)). In the end, they identify 254 pairs that are most likely confused by investors. In each confusing ticker pair, there is a big firm and a small firm in terms of market capitalization.

Insider trading data come from the Thomson Reuters Insider Filing Data. Following Ali, Wei, and Zhou (2011), I only include open-market transactions made by the directors and officers of a firm, as they are the people who are familiar with the firm's fundamentals and thus able to identify short-term price movements caused by non-fundamental reasons. In addition, I exclude duplicate filings, transactions of fewer than 100 shares or more than 20% of a firm's outstanding shares, and transactions with trade prices that deviate from CRSP prices by more than 50%.

Stock data, such as stock returns, come from CRSP. Firm-level financial data such as investment (capital expenditure), cash holding, and PP&E come from the CRSP and Compustat merged database, and all financial measures are calculated according to definitions discussed in detail in Section A of the Appendix. All financial measures are observed at a quarterly frequency. Corporate events data, including earnings announcements, company-issued guidance, forecast revisions, and recommendation changes issued by financial analysts, come from I/B/E/S.

The sample period is from 1993 to 2013. But it also depends on the start and end dates of the period when the confusion was present because some firms may change their tickers

or names, and then the confusion pair terminates. For example, Bed Bath & Beyond Inc (Ticker: BBBY) and Bedford Property Investors Inc (Ticker: BED) share a confusing ticker because the ticker of Bedford is part of the name of Bed Bath & Beyond. On July 2, 1993, Bedford changed its name from ICM Property Investors Inc, and its ticker changed from ICM to BED. This was when the confusion period started. On May 5, 2006, Bedford was delisted from NYSE because it had been acquired by LBA Realty LLC. This was when the confusion period ended. Therefore, the confusion period for the BBBY-BED pair is from July 2, 1993, to May 5, 2006. For each pair, I only include observations within the confusion period, which results in 1,414 firm-quarters in the final sample.

B. Identification Strategy

To identify short-term non-fundamental mispricing shocks, I execute the following steps:

- First, for stock i on day d, I use the return data from day d-90 to day d-1 as the rolling regression data. Then, I regress stock i's 10-minute interval returns on the market (SPY) 10-minute interval returns to estimate stock i's high-frequency CAPM beta. To gain enough statistical power, I require at least 30 trading days of data in the rolling regression.

- Second, I use the beta estimate from the previous step to calculate 10-minute residual returns for stock i on day d. I repeat these two steps for all stock-days in the sample.

- Third, for the big firm in the confusing ticker pair j, I identify its extreme price movements (EPMs) by labeling all 10-minute residual returns that are either higher than the 99th percentile or lower than the 1st percentile of its residual returns distribution.

- Fourth, I require the turnover correlation between the big firm and the small firm in the confusing ticker pair j around the big firm EPM to be greater than 0.5. The turnover correlation is calculated as the correlation between 1-minute interval turnovers of the paired firms in the 30-minute window (10 minutes before the EPM and 10 minutes after the EPM) around the big firm EPM.

- Fifth, I look at how the stock price of the small firm reacts to the big firm EPM. Specifically, the 10-minute residual return of the small firm at the big firm EPM. Then, those small firm mispricing shocks are sorted into deciles according to the value of residual returns. In order to have their magnitudes large enough, I only keep mispricing shocks that belong to either the top or the bottom deciles.

In addition, in order to see how the actual trading activity of the small firm looks like around the big firm EPM, I also estimate 10-minute residual turnovers by running a similar rolling regression of 10-minute interval turnovers of the market 10-minute interval turnovers and calculating residuals using the estimated turnover beta from it.

Figure 1 Panel A plots the average 10-minute residual turnover of small firms in the 410-minute window (200 minutes before the EPM and 200 minutes after the EPM) around their corresponding big firm EPMs. There is a clear spike in the trading activity of the small firm around the EPM time, which suggests the probability of ticker-confusing trading is high. Figure 1 Panel B plots the average cumulative 10-minute residual return of small firms in the 410-minute window around the big firm EPMs. Small firms are divided into two groups depending on whether their corresponding big firms have positive or negative EPMs. On the one hand, when the big firm is experiencing positive EPMs, there is a clear stock price jump in the small firm. On the other hand, when the big firm is experiencing negative EPMs, there is a clear stock price crash in the small firm.

Figure 2 plots the average cumulative 10-minute residual return of small firms in a longer window (15 days after the EPM) around the big firm EPMs. It takes about 10 days for the stock price jump and crash in the small firm to fully reverse.

The key assumption necessary to identify those short-term non-fundamental mispricing shocks is that they should not be driven by fundamental news, and they should be large enough in order to catch the manager's attention in the short term. I assume that the price movement of the small firm in the confusion pair driven by the EPM of the big firm in the confusion pair through ticker-confusing trading should be exogenous to the management of the small firm. In this setting, there are three concerns that could threaten the identifying assumption.

First, it is still possible that the short-term mispricing shocks are driven by fundamental news instead of the ticker-confusing trading activity. I alleviate this concern from three different levels. At the market level, I use residual returns that are orthogonal to the market return to identify mispricing shocks. At the industry level, I require that firms in each confusing ticker pair belong to two different two-digit SIC groups to avoid co-movement caused by intra-industry factors. At the firm level, I exclude stock-days with four common corporate events: earnings announcements, company-issued guidance, forecast revisions, and recommendation changes issued by financial analysts.

Second, in the identification strategy, I inherently assume it is the case that trading on the big firm around the big firm EPM induced ticker-confusing trading on the small firm, which resulted in its price movement. This is because the big firm is generally at least ten times larger than the small firm in terms of market capitalization in all confusing ticker pairs. I further check the validity of this assumption by looking at how the stock price of the big firm reacts to the small firm EPM. Figure B1 in the Appendix plots the average

cumulative 10-minute residual return of big firms in the 410-minute window around the small firm EPMs. As we can see, the reaction of the big firm stock price is much smaller when compared to the reaction of the small firm, which suggests that it is mainly the case that the extraordinary trading in the big firm induces ticker-confusing trading in the small firm, but not vice versa.

Third, if the magnitude of the mispricing shock is too small and dissipates quickly, then managers would treat it as trading noise instead of paying attention to it. To alleviate this concern, I only include mispricing shocks with their 10-minute residual return belonging to either the top or the bottom deciles of the mispricing shock distribution. In Table I rows (1) and (2), I report the summary statistics for the magnitude of mispricing shocks in the sample. The average 10-minute residual return of the small firm is 2.070% for positive big firm EPMs and -2.039% for negative big firm EPMs. I argue that a 2% abnormal return relative to the market return within a 10-minute window would be large enough to raise the manager's attention, especially after excluding the first (9:30 - 9:40) and last (15:50 - 16:00) intervals from regular trading hours.

C. Statistical Power and the Minimum Detectable Effect Size

In order to identify short-term non-fundamental mispricing shocks, I exploit the existence of ticker-confusing trading. In each confusing ticker pair, there is a big firm and a small firm in terms of market capitalization. Since it is mainly the case that the extraordinary trading in the big firm induces ticker-confusing trading in the small firm, which results in its price movement, all mispricing shocks I identified are on the small firm's stock. As a result, our sample is smaller than the population of firms, which could affect the statistical power of our tests. Since many of our main findings are non-results, it is important to establish

whether our tests are adequately powered. To address this, in each regression table, I report the minimum detectable effect size (MDES) as defined by Bloom (1995)[3] along with the corresponding sample standard deviation. The MDES provides information about the statistical power for each estimate and each dependent variable of interest, and I consistently find evidence that those tests are adequately powered.

D. Summary Statistics

Table I reports the summary statistics for short-term mispricing shocks and all dependent variables used in the analyses. *Positive* $AR_{[0,0]}$ is the 10-minute residual return of the small firm at the positive big firm extreme price movement (EPM), while *Negative* $AR_{[0,0]}$ is the 10-minute residual return of the small firm at the negative big firm EPM. *Positive* $AR_{[-200,+200]}$ is the cumulative 10-minute residual return of the small firm in the 410-minute window (200 minutes before the EPM and 200 minutes after the EPM) around the positive big firm EPM, while *Negative* $AR_{[-200,+200]}$ is the cumulative 10-minute residual return of the small firm in the 410-minute window around the negative big firm EPM. The small firm refers to the firm with a lower market capitalization in the confusing ticker pair, while the big firm refers to the firm with a higher market capitalization.

IV. Analysis

I examine the effects of short-term non-fundamental price movements from several different aspects. I first test hypothesis 1 by examining whether insider trading is positively

[3]I assume that for each of our estimates, the coefficient follows a t-distribution with the appropriate degrees of freedom. I then calculate the MDES under a two-sided test with significance level $\alpha = 0.05$ and power level $\beta = 0.2$.

related to the direction of price movement after the mispricing shock. I find they are actually negatively related. I then test hypothesis 2 by examining whether firms increase equity issuance or share repurchase after the mispricing shock. I do not find evidence that managers change their financing decisions. Last, I explore whether price movements affect real economic outcomes, including investment and cash management. I find firms do change their use of internal capital markets; however, there is little evidence that those price movements changed real economic variables like investment.

A. Insider Trading

After identifying those short-term non-fundamental price movements, I start by examining how insider trading activity changes. Specifically, I look at the net insider's demand in periods with different lengths after mispricing shocks. I run regressions of the following form:

$$Net\_Purchase_{i,[d,d+n]} = \alpha + \beta \cdot Daily\_AR\_Sum_{i,d} + \delta_i + \delta_q + \varepsilon_{i,d}, \tag{1}$$

where the dependent variable $Net\_Purchase_{i,[d,d+n]}$ is the difference between total insider purchase and total insider sale scaled by average shares outstanding of firm i during the period from day d to day $d+n$ ($n = 5, 10, 15$). The explanatory variable $Daily\_AR\_Sum_{i,d}$ is the sum of the 10-minute residual return of short-term mispricing shocks of firm i in day d. I only include stock-days with at least one mispricing shock. Firm fixed effects (δ_i) and quarter (δ_q) fixed effects are included in all regressions, and robust standard errors are clustered at the firm level.

Table II displays results for insider trading. In column (1), the negative and statistically significant coefficient of -0.002767 suggests that a 1% increase in the magnitude of mispricing

shock actually decreases the net insider's demand within the next 5 trading days by 0.28%, which indicates insiders sell more stock after a positive mispricing shock and purchase more stock after a negative mispricing shock. These results are consistent with the behavior of contrarian traders. In columns (2) and (3), I check the robustness of results by extending the window to 10 and 15 trading days after the mispricing shock. Both coefficients are negative and statistically significant, and the effect becomes larger as I extend the window. Overall, the results suggest that insider trading after the mispricing shock is negatively related to the direction of price movement. Managers seem to be able to distinguish ticker-confusing-trading-induced price movements from fundamental price movements. Therefore, Hypothesis 1 is rejected; short-term non-fundamental price movements are not unlikely to affect a firm's real behavior through the managerial learning channel.

B. Financing Decisions

While the evidence in Section IV.A makes clear that short-term non-fundamental price movements are not unlikely to affect a firm's real behavior through the managerial learning channel, it remains unclear whether the financing channel works. In this section, I examine a variety of firm-level financing decision measures using regressions of the following form:

$$y_{i,q} = \alpha + \beta_1 \cdot |Pos\_AR\_Sum_{i,q}| + \beta_2 \cdot |Neg\_AR\_Sum_{i,q}| + \delta_i + \delta_q + \varepsilon_{i,q}, \tag{2}$$

where the dependent variable $y_{i,q}$ is the outcome variable of interest, such as equity issuance, debt issuance, and shares repurchased, of firm i in quarter q. The explanatory variable $Pos\_AR\_Sum_{i,q}$ is the sum of the 10-minute residual return of positive short-term mispricing shocks of firm i in quarter q, while $Neg\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of negative short-term mispricing shocks of firm i in quarter q. Firm fixed effects (δ_i) and

quarter fixed effects (δ_q) are included in all regressions, and robust standard errors are clustered at the firm level.

Table III displays results for equity financing. In columns (1) and (2), I directly test Hypothesis 2 by setting the equity issuance ratio and buyback ratio as the dependent variable. However, I find firms neither increase their equity issuance after positive mispricing shocks nor increase their share repurchase after negative mispricing shocks. In column (3), the statically insignificant coefficient indicates the firm's dividend payout policy also does not change after mispricing shocks. As a result, in column (4), I find the quarterly cost of equity measure is not significantly affected. In sum, short-term non-fundamental price movements do not change managers' financing decisions on equity financing.

It is important to note that the finding of no effect on a firm's equity financing decisions is not due to a lack of statistical power. For example, in column (1) of Table III. The sample standard deviation of the equity issuance ratio is 4.708, while the MDES for Pos_AR_Sum estimate under this regression setting is 0.0368. Thus, the research design has the ability to reliably detect an effect on the order of (0.0368 / 4.708) = 0.8% of one standard deviation. Yet I find no effect. The magnitude difference between MDES and sample standard deviation are similar for Neg_AR_Sum and other dependent variables.

Next, I want to see whether short-term non-fundamental price movements change the firm's debt financing and capital structure. To do this, in Table IV, I examine the effects of mispricing shocks on the leverage ratio in column (1), debt issuance ratio in column (2), and the average cost of debt in column (3). The statistically insignificant coefficients in these three columns suggest that firms also do not change their capital structure and debt financing decisions in response to short-term mispricing shocks.

Once again, for all insignificant results in Table IV, the MDES are significantly lower than

the sample standard deviation of their corresponding dependent variables. So, the finding of zero impact is not due to a lack of power.

Overall, the results in this section suggest that, possibly due to a lack of time, managers do not change their use of external capital markets when there are short-term non-fundamental price movements. Therefore, Hypothesis 2 is also rejected; short-term non-fundamental price movements are not unlikely to affect a firm's real behavior through the financing channel.

C. Real Economic Outcomes

In light of the findings in the previous two sections that reject both the managerial learning channel and the financing channel, it is natural to assume short-term non-fundamental price movements would not have a significant impact on a firm's real behavior. In this section, I examine whether firms change their investment decisions and cash management in response to mispricing shocks using the regression specification shown in Equation (2).

Table V displays results for real effects. In column (1), the dependent variable is the ratio of investment (capital expenditure) to total assets. Both coefficients of Pos_AR_Sum and Neg_AR_Sum are not statistically different from zero. This result indicates firms do not change their investment decisions in response to mispricing shocks. Similarly, in column (2), I find the fixed assets investment is not significantly affected.

Then, in columns (3) and (4), I find some significant results on the ratio of inventory to total assets and the ratio of cash holding to total assets. On the one hand, positive mispricing shocks make firms decrease their inventory level and accumulate more cash. On the other hand, negative mispricing shocks make firms increase their inventory level and adopt a more aggressive cash policy. Short-term non-fundamental price movements do affect the firm's use of internal capital markets. These results suggest that managers may use internal capital

markets more often when external capital markets become inefficient because of short-term mispricing shocks.

Overall, the non-results on capital expenditure and fixed assets investment are largely consistent with the results that both the managerial learning channel and the financing channel do not work. Since managers can identify those price movements as non-fundamental mispricing, and they do not change any of their financing decisions, their investment decisions would not be affected as well. Also, although firms do not change their use of external capital markets, they do change their use of internal capital markets.

V. Conclusion

In this paper, I provide a novel approach to capture short-term non-fundamental price movements that can be used in real effects research. For two firms in a confusing ticker pair, extreme price movements of the big firm trigger ticker-confusing trading, which results in stock price changes of the small firm. This is because their ticker or name are similar, so investors can easily get confused. Price movements caused by ticker-confusing trading would be non-fundamental to the small firm if there is no fundamental news happening in the small firm around that time.

Using those mispricing shocks, I test two channels in which short-term non-fundamental price movements can affect a firm's real behavior: the managerial learning channel and the financing channel. In the empirical results, I find insiders act like contrarian traders after mispricing shocks, which suggests that they might be able to distinguish those non-fundamental price movements from fundamental ones. Also, I do not find any evidence that shows managers change their financing decisions after mispricing shocks. In sum, the

empirical results reject both channels. Thus, as expected, short-term non-fundamental price movements do not change a firm's real behavior. In the end, although those mispricing shocks do not affect a firm's use of external capital markets, firms do use internal capital markets more in response to the inefficiency of external capital markets.

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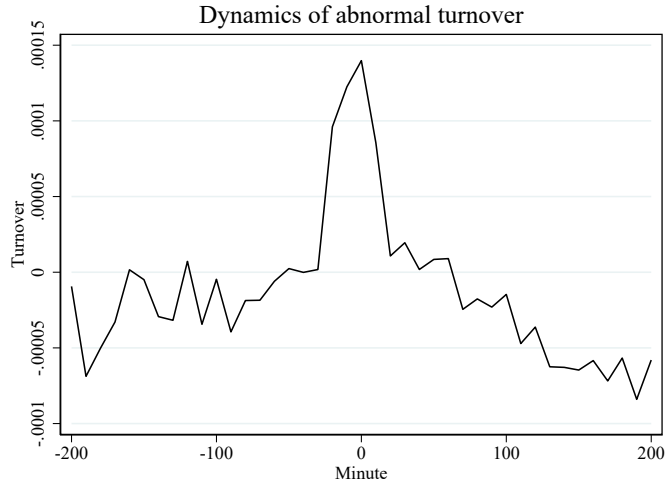
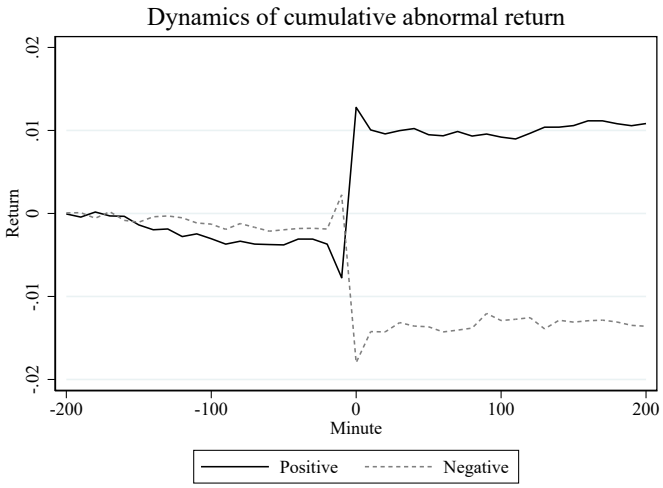


(a) Panel A



(b) Panel B

Figure 1.Dynamics of Abnormal Turnover and Cumulative Abnormal Return around Extreme Price Movements

The figures plot the average 10-minute residual turnover (Panel A) and cumulative 10-minute residual return (Panel B) of the smaller firm around its corresponding bigger firm's extreme price movements (EPMs). The bigger and smaller firms refer to the big and small firms, respectively, in terms of market capitalization in the confusing ticker pair. Residual turnovers and returns are calculated by following the steps discussed in Section III.B.

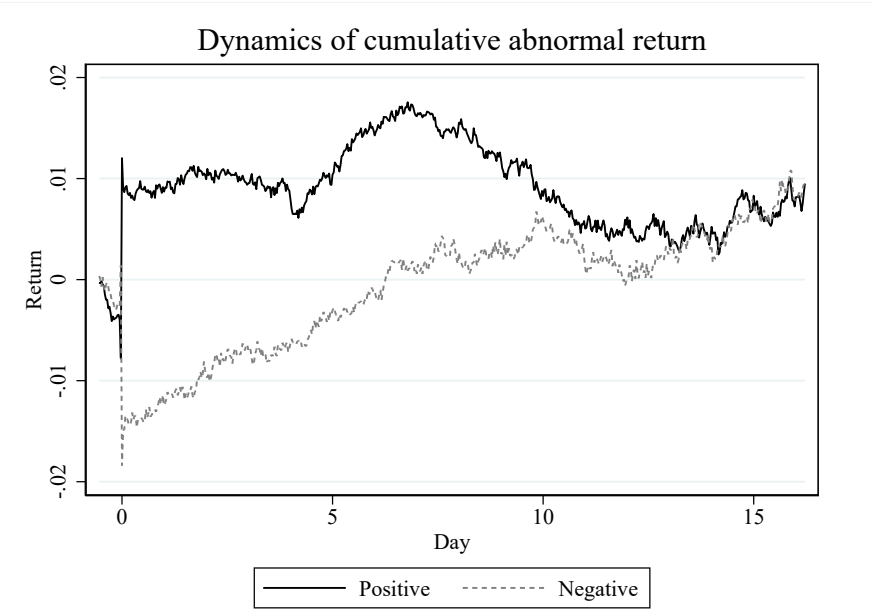


Figure 2.Dynamics of Cumulative Abnormal Return around Extreme Price Movements (Long Window)

The figures plot the average 10-minute cumulative 10-minute residual return of the smaller firm in the long window around its corresponding bigger firm's extreme price movements (EPMs). The bigger and smaller firms refer to the big and small firms, respectively, in terms of market capitalization in the confusing ticker pair. Residual turnovers and returns are calculated by following the steps discussed in Section III.B.

Table I
Summary Statistics

The table presents summary statistics for short-term mispricing shocks and all dependent variables used in the analyses. For each variable, I present the mean, the standard deviation (SD), the 25th percentile (p25), the median (p50), and the 75th percentile (p75). Short-term mispricing shock variables (*Positive* $AR_{[0,0]}$, *Negative* $AR_{[0,0]}$, *Positive* $CAR_{[-200,+200]}$, and *Negative* $CAR_{[-200,+200]}$) are defined in Section III.D. Definitions and constructions for all other variables are discussed in detail in Section A of the Appendix.

All Variables	(1) Mean	(2) SD	(3) p25	(4) p50	(5) p75
Positive $AR_{[0,0]}$ (%)	2.070	1.812	1.122	1.489	2.312
Negative $AR_{[0,0]}$ (%)	-2.039	1.735	-2.254	-1.458	-1.116
Positive $CAR_{[-200,+200]}$ (%)	1.083	6.530	-1.649	0.836	3.512
Negative $CAR_{[-200,+200]}$ (%)	-1.359	6.543	-4.218	-1.301	1.268
Market Capitalization (\$*Billions*)	0.732	1.499	0.064	0.202	0.572
Total Assets (\$*Millions*)	1.439	3.135	0.059	0.347	1.187
Investment to Asset Ratio	0.013	0.052	0.001	0.006	0.016
Cash to Asset Ratio	0.146	0.189	0.018	0.059	0.198
PP&E to Asset Ratio	0.205	0.241	0.021	0.095	0.292
Inventory to Asset Ratio	0.080	0.130	0.000	0.020	0.114
Dividend Payout Ratio	0.044	3.565	0.000	0.000	0.192
Stock Buyback Ratio	0.003	0.007	0.000	0.000	0.002
Equity Issuance Ratio	0.201	4.474	0.000	0.003	0.017
Debt Issuance Ratio	0.424	3.938	-0.076	0.000	0.108
Cost of Equity	0.025	0.054	0.001	0.025	0.048
Average Cost of Debt	0.032	0.118	0.013	0.019	0.024

Table II
Insider Net Purchase after Short-term Mispricing

The table presents the coefficient estimates from the regressions that examine the effect of short-term mispricing shocks on insider's net purchase of the stock using the following form:

$$Net\_Purchase_{i,[d,d+n]} = \alpha + \beta \cdot Daily\_AR\_Sum_{i,d} + \delta_i + \delta_q + \varepsilon_{i,d},$$

where the dependent variable $Net\_Purchase_{i,[d,d+n]}$ is the difference between total insider purchase and total insider sale scaled by average shares outstanding of firm i during the period from day d to day $d+n$ ($n = 5, 10, 15$). Only open-market transactions made by the directors and officers of a firm are included. The explanatory variables $Daily\_AR\_Sum_{i,d}$ is the sum of the 10-minute residual return of short-term mispricing shocks (both $Positive\ AR_{[0,0]}$ and $Negative\ AR_{[0,0]}$) of firm i in day d. Firm fixed effects (δ_i) and quarter (δ_q) fixed effects are included in all regressions. t-statistics calculated using robust standard errors, clustered at the firm level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variables		
Explanatory Variables	$Net\_Insider_{[0,+5]}$ (1)	$Net\_Insider_{[0,+10]}$ (2)	$Net\_Insider_{[0,+15]}$ (3)
Daily_AR_Sum	-0.002767**	-0.003018**	-0.003364**
	(-1.98)	(-2.03)	(-2.00)
Constant	0.014901***	0.015940***	0.019031***
	(8.89)	(8.97)	(9.46)
Observations	5,803	5,803	5,803
R-squared	0.111	0.113	0.132
Clustered S.E.	Firm	Firm	Firm
Firm F.E.	Y	Y	Y
Quarter F.E.	Y	Y	Y

Table III
Impact of Short-term Mispricing on Equity Financing

The table presents the coefficient estimates from the regressions that examine the equity financing effects of short-term mispricing shocks using the following form:

$$y_{i,q} = \alpha + \beta_1 \cdot |Pos\_AR\_Sum_{i,q}| + \beta_2 \cdot |Neg\_AR\_Sum_{i,q}| + \delta_i + \delta_q + \varepsilon_{i,q},$$

where the dependent variables $y_{i,q}$ is either the equity issuance ratio (*equity_issuance*) in column (1), the shares repurchased to shares outstanding ratio (*buyback_ratio*) in column (2), the dividends to earnings ratio (*payout_ratio*) in column (3), or the quarterly cost of equity measure based on Fama-French five-factor model ($FF5\_CoE$) in column (4), of firm i in quarter q. The explanatory variable $Pos\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of positive short-term mispricing shocks ($Positive\ AR_{[0,0]}$) of firm i in quarter q, while $Neg\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of negative short-term mispricing shocks ($Negative\ AR_{[0,0]}$) of firm i in quarter q. Absolute values of both explanatory variables are used in the regressions to facilitate the interpretation of the sign of the coefficient. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter (δ_q) fixed effects are included in all regressions. t-statistics calculated using robust standard errors, clustered at the firm level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variables			
Explanatory Variables	*equity_issuance* (1)	*buyback_ratio* (2)	*payout_ratio* (3)	*FF5_CoE* (4)
Pos_AR_Sum	-0.000012	-0.000014	-0.007512	-0.000492
	(-0.00)	(-1.03)	(-1.02)	(-1.27)
Neg_AR_Sum	-0.018047	-0.000014	0.018400	0.000605
	(-0.50)	(-0.57)	(1.40)	(1.45)
MDES (Pos)	0.0368	3.89e-05	0.0206	0.00109
MDES (Neg)	0.100	6.85e-05	0.0368	0.00117
Sample St. Dev.	4.708	0.00328	3.564	0.0537
Observations	1,310	1,411	1,194	1,391
R-squared	0.169	0.284	0.094	0.148
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Quarter F.E.	Y	Y	Y	Y

Table IV
Impact of Short-term Mispricing on Debt Financing

The table presents the coefficient estimates from the regressions that examine the debt financing effects of short-term mispricing shocks using the following form:

$$y_{i,q} = \alpha + \beta_1 \cdot |Pos\_AR\_Sum_{i,q}| + \beta_2 \cdot |Neg\_AR\_Sum_{i,q}| + \delta_i + \delta_q + \varepsilon_{i,q},$$

where the dependent variables $y_{i,q}$ is either the leverage ratio (lev_ratio) in column (1), the debt issuance ratio ($debt\_issuance$) in column (2), or the average cost of debt (CoD) in column (3), of firm i in quarter q. The explanatory variable $Pos\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of positive short-term mispricing shocks ($Positive\ AR_{[0,0]}$) of firm i in quarter q, while $Neg\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of negative short-term mispricing shocks ($Negative\ AR_{[0,0]}$) of firm i in quarter q. Absolute values of both explanatory variables are used in the regressions to facilitate the interpretation of the sign of the coefficient. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter (δ_q) fixed effects are included in all regressions. t-statistics calculated using robust standard errors, clustered at the firm level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variables		
Explanatory Variables	lev_ratio (1)	$debt\_issuance$ (2)	CoD (3)
Pos_AR_Sum	-0.000996	0.095713	0.001618
	(-0.99)	(0.37)	(1.07)
Neg_AR_Sum	0.001963	-0.221747	-0.001174
	(1.51)	(-0.79)	(-0.91)
MDES (Pos)	0.00283	0.731	0.00423
MDES (Neg)	0.00365	0.790	0.00362
Sample St. Dev.	0.333	56.63	0.118
Observations	1,247	1,020	768
R-squared	0.637	0.288	0.264
Clustered S.E.	Firm	Firm	Firm
Firm F.E.	Y	Y	Y
Quarter F.E.	Y	Y	Y

Table V
Impact of Short-term Mispricing on Real Firm Behavior

The table presents the coefficient estimates from the regressions that examine the real economic effects of short-term mispricing shocks using the following form:

$$y_{i,q} = \alpha + \beta_1 \cdot |Pos\_AR\_Sum_{i,q}| + \beta_2 \cdot |Neg\_AR\_Sum_{i,q}| + \delta_i + \delta_q + \varepsilon_{i,q},$$

where the dependent variables $y_{i,q}$ is either the capital expenditure to total assets ratio (*invest_to_at*) in column (1), the property plant and equipment to total assets ratio (*ppent_to_at*) in column (2), the inventory to total assets ratio (*invt_to_at*) in column (3), or the cash holding to total assets ratio (*cash_to_at*) in column (4), of firm i in quarter q. The explanatory variable $Pos\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of positive short-term mispricing shocks ($Positive\ AR_{[0,0]}$) of firm i in quarter q, while $Neg\_AR\_Sum_{i,q}$ is the sum of 10-minute residual return of negative short-term mispricing shocks ($Negative\ AR_{[0,0]}$) of firm i in quarter q. Absolute values of both explanatory variables are used in the regressions to facilitate the interpretation of the sign of the coefficient. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter (δ_q) fixed effects are included in all regressions. t-statistics calculated using robust standard errors, clustered at the firm level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variables			
Explanatory Variables	*invest_to_at* (1)	*ppent_to_at* (2)	*invt_to_at* (3)	*cash_to_at* (4)
Pos_AR_Sum	-0.000081	-0.000184	-0.000951***	0.004912***
	(-0.55)	(-0.28)	(-7.50)	(5.18)
Neg_AR_Sum	0.000243	-0.001298	0.001096***	-0.003162**
	(0.80)	(-1.58)	(3.89)	(-2.36)
MDES (Pos)	0.000416	0.00184	0.000355	0.00265
MDES (Neg)	0.000848	0.00230	0.000788	0.00375
Sample St. Dev.	0.0520	0.241	0.130	0.188
Observations	1,168	1,280	1,264	1,334
R-squared	0.350	0.943	0.863	0.665
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Quarter F.E.	Y	Y	Y	Y

Appendix

A. Data and Variable Definitions

All financial ratios are calculated at quarterly frequency using the firm-level financial data from the Center for Research in Security Prices (CRSP) and Compustat merged database. Their definitions are listed below. Item names refer to Compustat data items.

- Market Capitalization: Item CSHOQ $\times$ Item PRCCQ
- Investment to Asset Ratio: (Item CAPXY - lagged Item CAPXY) / Item ATQ
- Cash to Asset Ratio: Item CHEQ / Item ATQ
- Leverage Ratio: (Item DLCQ + Item DLTTQ) / (Item DLCQ + Item DLTTQ + Item SEQQ)
- PP&E to Asset Ratio: Item PPENTQ / Item ATQ
- Inventory to Asset Ratio: Item INVTQ / Item ATQ
- Dividend Payout Ratio: (Item DVY - lagged Item DVY) / Item IBADJQ
- Stock Buyback Ratio: Item CSHOPQ / Item CSHOQ
- Equity Issuance Ratio: ((Item CEQQ - Item REQ) - (lagged Item CEQQ - lagged Item REQ)) / lagged Item CEQQ
- Debt Issuance of Ratio: (Item DLCQ + Item DLTTQ - lagged Item DLCQ - lagged Item DLTTQ) / (lagged Item DLCQ + lagged Item DLTTQ))
- Average Cost of Debt: Item XINTQ / (Item DLCQ + Item DLTTQ)

To measure the cost of equity, I construct the quarterly cost of equity measure based on Fama and French (2015) five-factor asset pricing model following Frank and Shen (2016). First, I estimate firm β of the five factors using daily stock returns in each calendar quarter. To gain enough statistical power, I require at least 30 trading days of data in each firm-quarter. The dependent variable is the excess stock return, and the explanatory variables are returns of the five factors.

$$r_{i,d} - r_{f,d} = \alpha + \beta_1 \cdot (r_{m,d} - r_{f,d}) + \beta_2 \cdot r_{smb,d} + \beta_3 \cdot r_{hml,d} + \beta_4 \cdot r_{rmw,d} + \beta_5 \cdot r_{cma,d} + \varepsilon_{i,d}$$

Next, I calculate the cost of equity measure from the following equation:

$$CoE_{FF5,q} = r_{f,q} + \hat{\beta}_1 \cdot \mathbb{E}[r_{m,q} - r_{f,q}] + \hat{\beta}_2 \cdot \mathbb{E}[r_{smb,q}] + \hat{\beta}_3 \cdot \mathbb{E}[r_{hml,q}] + \hat{\beta}_4 \cdot \mathbb{E}[r_{rmw,q}] + \hat{\beta}_5 \cdot \mathbb{E}[r_{cma,q}]$$

where $\hat{\beta}$ are coefficient estimates from the previous step. r_f is the ten-year Treasury yield from the Federal Reserve Economic Data (FRED). $\mathbb{E}[r_m - r_f]$ is the historical mean of the market excess return; that is, the time t expected market premium is the average of the market excess return from time 1 to time $t-1$. $\mathbb{E}[r_{smb}]$, $\mathbb{E}[r_{hml}]$, $\mathbb{E}[r_{rmw}]$, and $\mathbb{E}[r_{cma}]$ are defined in a similar way as $\mathbb{E}[r_m - r_f]$.

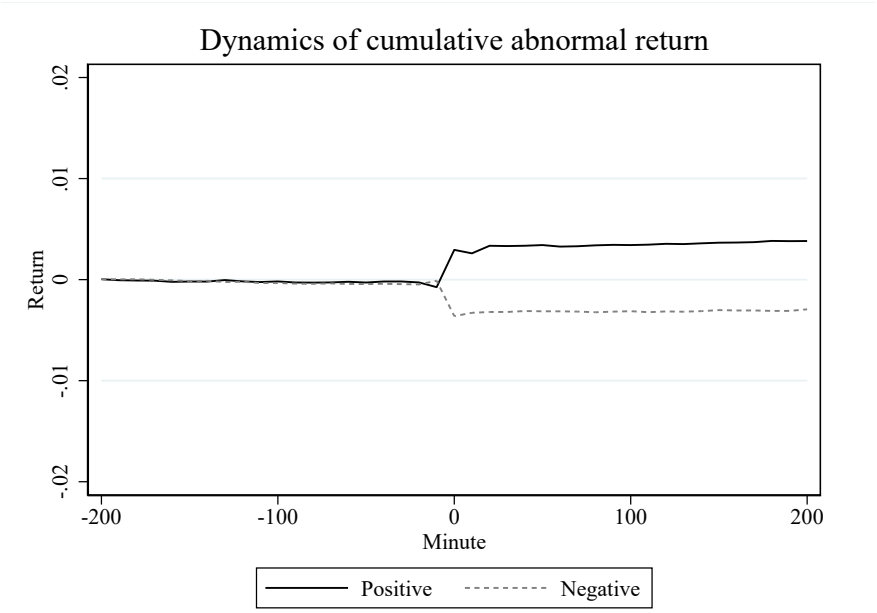


Figure B1.Supplement to Figure 1

The figures plot the average cumulative 10-minute residual return of the bigger firm around its corresponding smaller firm's extreme price movements (EPMs). The bigger and smaller firms refer to the big and small firms, respectively, in terms of market capitalization in the confusing ticker pair. Residual returns are calculated by following the steps discussed in Section III.B.