

OVERNIGHT SENTIMENT DIVERGENCE AND OPENING PRICE FORMATION: EVIDENCE FROM RETAIL INVESTOR TEXT

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Abstract. This research study examines how the investor disagreement formed during non-trading hours influences stock price formation at the market open. Using a large dataset of retail investor forum posts from China's A-share market; this research study constructs an entropy-based measure of overnight sentiment divergence derived from text-level sentiment classification. The empirical results reveal a consistent pattern: higher sentiment divergence is associated with lower opening returns. This relationship remains robust after controlling for firm characteristics, market-wide overnight movements, and corporate announcements. Importantly, the sentiment divergence retains explanatory power even after accounting for average sentiment, indicating that disagreement captures an independent dimension of investor behavior beyond sentiment direction. Further analysis shows that the effect is significantly stronger in stocks with higher trading activity, suggesting that active trading environments amplify the pricing impact of disagreement. Overall, the findings highlight the role of investor belief dispersion as a key factor in short-term price dynamics.

Keywords: *investor sentiment, sentiment divergence, opening returns, retail investors, textual analysis*

Introduction

Financial markets do not process information continuously. During non-trading hours, new information arrives, investors interpret it, and expectations evolve, yet prices remain unchanged. When the market reopens, these accumulated expectations must be incorporated into prices within a short period. The opening phase therefore represents a critical moment in price formation, linking overnight information accumulation to observable market outcomes (Moshirian et al., 2012; Greene and Watts, 1996). Most existing studies focus on the role of information itself, such as macroeconomic announcements, firm disclosures, or market-wide shocks (Liu et al., 2024; Ham et al., 2023; Liu et al., 2023; Ham et al., 2022). However, information does not affect all investors uniformly. Investors often interpret identical signals differently, leading to variation in expectations. What matters, therefore, is not only the direction of sentiment, but also the extent to which investors disagree. This study focuses on that disagreement. Specifically, it examines how divergence in investor sentiment formed during non-trading hours affects stock returns at the market open. The overnight period provides a unique setting because trading is suspended. As a result, differences in opinion cannot be resolved through price adjustments. Instead, disagreement accumulates and is only expressed when the market reopens (Chu et al., 2024; Akbas et al., 2022).

The importance of disagreement has long been recognized in financial theory. Under short-sale constraints, divergent beliefs may lead to overvaluation, as pessimistic investors are unable to fully express their views in prices (Diether et al., 2002; Miller,

1977). An alternative perspective treats disagreement as a form of uncertainty arising from differences in information or interpretation, which may influence expected returns through risk compensation (Merton, 1987; Varian, 1985). Despite these theoretical insights, empirical research has largely relied on indirect proxies such as analyst forecast dispersion, which are limited in frequency and may not capture the dynamics of belief formation among retail investors (Al-Nasser and Menla Ali, 2018; Banerjee, 2011). In recent years, the availability of large-scale textual data has created new opportunities to measure investor sentiment directly. Online platforms allow investors to express views continuously, even when markets are closed, providing a high-frequency record of sentiment formation and interaction (Booker et al., 2023; Agarwal et al., 2019). In retail-dominated markets, such as China's A-share market, these platforms play a particularly important role in shaping investor expectations (Guo et al., 2025; Wang et al., 2025; Meng et al., 2024). To capture disagreement in this setting, this study constructs a measure of overnight sentiment divergence based on investor-generated text. Individual forum posts are first classified into sentiment categories using a financial-domain language model. These classifications are then aggregated into a distribution for each stock during the overnight period. The degree of divergence is measured using entropy, which reflects how dispersed sentiment is across categories (Shannon, 1948). A more even distribution indicates greater disagreement among investors.

The empirical analysis examines how this measure of sentiment divergence relates to stock returns at the market open. The results show a consistent pattern. Stocks with higher overnight sentiment divergence experience lower opening returns on the following trading day. This relationship remains robust after controlling for firm characteristics, market-wide overnight movements, and corporate announcements. A key question is whether this effect simply reflects the overall direction of sentiment. To address this, the analysis distinguishes between sentiment level and sentiment divergence. The findings show that average sentiment is positively related to opening returns, while sentiment divergence is negatively related. More importantly, both effects remain significant when included in the same model. This indicates that divergence contains additional information beyond sentiment direction, consistent with the view that disagreement introduces friction into price formation (Wang et al., 2025; Siganos et al., 2017). Further analysis shows that the effect of sentiment divergence is not uniform across stocks. It is significantly stronger among stocks with higher trading activity. This suggests that disagreement among investors is more likely to influence prices in environments where trading is active and order flow is more responsive, aligning with prior evidence on the interaction between investor disagreement and trading dynamics (Cao et al., 2021; Garfinkel and Sokobin, 2006).

Taken together, the evidence points to a clear mechanism. During non-trading hours, investors form different interpretations of information, leading to disagreement. When the market opens, these differences are expressed through trading decisions. In the absence of continuous adjustment, this leads to imbalances in supply and demand, which are reflected in opening prices. This study contributes to the literature in three main ways. First, it introduces a direct and high-frequency measure of investor disagreement based on textual data, allowing a clear distinction between sentiment level and sentiment dispersion. Second, it provides empirical evidence that disagreement formed during non-trading hours has a measurable impact on opening price formation. Third, it shows that the pricing effect of disagreement depends on market conditions,

particularly trading activity. Overall, the findings suggest that market prices reflect not only the average belief of investors, but also the degree of disagreement among them. Incorporating this dimension provides a more complete understanding of how prices are formed, particularly at critical points such as the market open.

Literature review

Opening price formation and overnight information

The process of price formation at the market open has long attracted attention in financial research. The opening price reflects the market's first response to information accumulated during non-trading hours and serves as a key mechanism for incorporating overnight news into asset prices (Moshirian et al., 2012; Greene and Watts, 1996). Unlike continuous trading periods, the opening phase involves a discrete adjustment, often through auction mechanisms, where latent supply and demand are matched. Prior studies have shown that a wide range of information shocks, such as macroeconomic announcements, firm disclosures, and global market movements; tend to accumulate overnight and are incorporated into prices at the opening (Liu et al., 2024; Ham et al., 2023; Liu et al., 2023; Ham et al., 2022). As a result, opening returns provide a useful setting for examining short-term pricing dynamics and the efficiency of information incorporation. However, much of this literature focuses on the content of information rather than the heterogeneity of investor responses. While the role of overnight information is well established, less attention has been given to how differences in interpretation among investors influence the price adjustment process. This omission is important because price formation depends not only on the arrival of information, but also on how that information is processed by market participants.

Investor disagreement and asset pricing

The role of investor disagreement in asset pricing has been examined from multiple theoretical perspectives. One influential framework is based on short-sale constraints. Miller (1977) argues that when pessimistic investors face constraints in expressing their views, prices tend to reflect the beliefs of more optimistic investors. As disagreement increases, this mechanism may lead to overvaluation and subsequent negative returns. Empirical evidence supporting this view has been documented in studies using measures such as analyst forecast dispersion (Chen et al., 2002; Diether et al., 2002). An alternative perspective treats disagreement as a proxy for uncertainty. In this view, differences in beliefs arise from variation in information or interpretation, and assets characterized by higher disagreement may command a risk premium (Merton, 1987; Varian, 1985). Empirical findings in this line of research suggest that disagreement may be positively associated with returns under certain conditions (Doukas et al., 2006; Garfinkel and Sokobin, 2006). Despite these theoretical advances, empirical research faces several limitations. Most studies rely on indirect proxies, such as analyst dispersion or trading volume, to capture disagreement (Al-Nasser and Menla Ali, 2018; Banerjee, 2011). These measures are typically low frequency and may be confounded by factors such as liquidity demand or information asymmetry. As a result, they may not accurately reflect the real-time formation of heterogeneous beliefs, particularly among retail investors.

Sentiment, social interaction, and text-based measures

The growing availability of unstructured textual data has provided new opportunities to measure investor sentiment more directly. Online platforms, including stock forums and social media, allow investors to express opinions continuously, generating large volumes of data that reflect real-time sentiment and interaction (Booker et al., 2023; Agarwal et al., 2019). Research using these data has shown that investor sentiment extracted from text can predict market outcomes, including returns and volatility (Liu et al., 2023; Siganos et al., 2017). More recent studies extend this approach by examining not only the level of sentiment but also its distribution across investors (Wang et al., 2025). This shift is important because it allows researchers to distinguish between consensus and disagreement in investor views. Advances in natural language processing, particularly the use of pre-trained language models, have further improved the accuracy of sentiment classification in financial contexts (Huang et al., 2023; Araci, 2019). These models are able to capture contextual nuances and domain-specific language, making them well suited for analyzing investor-generated text. Despite these developments, most studies continue to focus on average sentiment. The distribution of sentiment, and the extent to which it reflects disagreement among investors, remains relatively underexplored. This gap is particularly relevant in retail-dominated markets, where sentiment is expressed more directly and at higher frequency.

Overnight sentiment and short-term price dynamics

The overnight period represents a unique environment for studying investor behavior. During this time, markets are closed, but information continues to flow and investors continue to form expectations. Several studies highlight the importance of overnight sentiment in explaining subsequent market outcomes, including volatility and returns (Chu et al., 2023; Aboody et al., 2018). However, existing research primarily focuses on the average level of sentiment during this period. The extent to which investors disagree, and how this disagreement affects price formation at the opening, remains insufficiently understood. This limitation is partly due to the lack of high-frequency measures that can capture the distribution of sentiment across investors. In the absence of trading, disagreement cannot be resolved through price discovery. Instead, it accumulates over time. When the market reopens, these accumulated differences are expressed through trading activity, potentially leading to imbalances in supply and demand. This mechanism suggests that disagreement formed overnight may have a direct impact on opening prices.

Research gap and hypothesis development

The literature points to three key gaps. First, while sentiment has been widely studied, most research focuses on its average level rather than its distribution. This makes it difficult to distinguish between situations where investors share similar views and those where opinions are highly dispersed. Second, existing measures of disagreement rely largely on indirect proxies, which may not capture the dynamics of belief formation among retail investors. Direct measures based on investor-generated text offer a more precise way to observe how disagreement emerges and evolves. Third, although the overnight period is recognized as an important window for information accumulation, there is limited empirical evidence on how disagreement formed during this period affects price formation at the market open. This study addresses these gaps by constructing a high-frequency, text-based measure of overnight sentiment divergence

and examining its impact on opening returns. Based on the theoretical and empirical considerations discussed above, the following hypotheses are proposed:

- H1: Higher overnight sentiment divergence is associated with lower opening returns.
- H2: The negative effect of overnight sentiment divergence on opening returns is stronger in stocks with higher trading activity.

These hypotheses reflect a mechanism in which disagreement formed during non-trading hours is translated into price pressure at the opening, particularly in environments where trading activity amplifies the impact of heterogeneous beliefs.

Materials and Methods

Research design and sample construction

This study adopts a quantitative research design to examine the relationship between overnight sentiment divergence and stock opening returns. The empirical setting focuses on China's A-share market, which provides a suitable environment due to its high level of retail investor participation and active use of online discussion platforms (Guo et al., 2025; Wang et al., 2025; Meng et al., 2024). The sample consists of firms listed in the CSI 300 Index over the period from January 2017 to April 2025. Daily stock-level data, including opening prices, closing prices, trading activity, and firm characteristics, are obtained from established financial databases. Firms with incomplete data on key variables are excluded to ensure consistency in estimation. The final dataset forms an unbalanced panel of firm-day observations. Investor sentiment data are derived from posts on a major online stock forum widely used by retail investors. Each post is associated with a specific stock and includes a timestamp, allowing precise alignment with trading days. This structure enables the construction of sentiment measures that reflect investor views formed prior to market opening. To ensure a clear temporal sequence, all explanatory variables are constructed using information available before the opening of the trading day. This design reduces concerns related to simultaneity and supports causal interpretation.

Sentiment classification and data processing

Investor sentiment is extracted from textual data using a financial-domain language model. Each post is classified into one of three sentiment categories: positive, neutral, or negative. This classification approach follows recent advances in text-based financial analysis, where machine learning models are used to capture contextual meaning in investor-generated content (Huang et al., 2023; Araci, 2019). Prior to classification, the raw textual data undergo standard preprocessing procedures. These include the removal of empty or non-informative posts, elimination of duplicate content, and exclusion of posts that primarily disseminate objective news rather than subjective opinions. These steps are necessary to improve the signal-to-noise ratio and ensure that the resulting sentiment measures reflect genuine investor views (Fedyk, 2021; Al-Nasseri and Menla Ali, 2018). The sentiment classification results are then aggregated at the stock-day level within a defined overnight window. This aggregation forms the basis for constructing measures of sentiment level and sentiment divergence. To further illustrate the temporal distribution of investor activity, *Figure 1* presents the intraday pattern of

posting behavior across different time intervals. As shown in *Figure 1*, posting activity is more concentrated during trading hours, reflecting heightened investor attention when markets are open. However, a substantial volume of posts is still observed during non-trading periods, indicating that investors continue to interpret information and form expectations even when trading is suspended. This pattern supports the use of overnight data to capture sentiment formation prior to market opening.

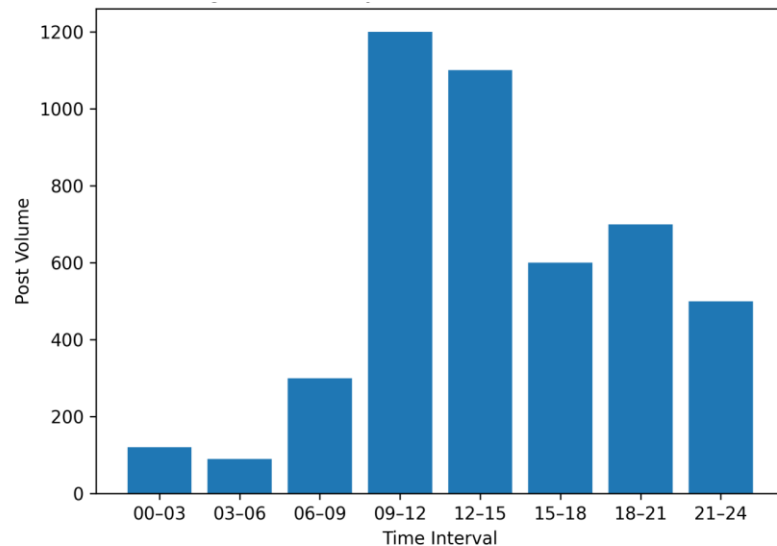


Figure 1. Intraday posting activity.

Measurement of overnight sentiment divergence

The key independent variable in this study is overnight sentiment divergence, which captures the dispersion of investor sentiment during non-trading hours. The overnight window is defined as the period between the market close of day $t-1$ and the opening of day t . This definition reflects the institutional structure of the market and ensures that sentiment is measured strictly before price realization (Chu et al., 2023). For each stock and each trading day, sentiment divergence is calculated using information entropy (Shannon, 1948). Let the proportions of positive, neutral, and negative posts define a probability distribution. The entropy of this distribution is then computed to measure the degree of dispersion. Entropy increases as sentiment becomes more evenly distributed across categories, indicating higher disagreement among investors. This approach has two important advantages. First, it captures disagreement directly as a distributional property rather than relying on indirect market-based proxies. Second, it allows for high-frequency measurement, making it suitable for analyzing short-term price dynamics. To ensure reliability, observations with extremely low numbers of overnight posts are excluded. This prevents the divergence measure from being driven by sparse or unrepresentative data.

Dependent variable

The dependent variable is the opening return, defined as the percentage change between the opening price on day t and the closing price on day $t-1$. This measure captures the immediate price adjustment that incorporates overnight information and investor expectations (Liu et al., 2024; Moshirian et al., 2012).

Control variables

To account for alternative explanations, the analysis includes a set of control variables commonly used in asset pricing studies. Firm Size: measured as the natural logarithm of market capitalization. Larger firms may exhibit different information environments and trading behavior. Book-to-Market Ratio: captures firm valuation characteristics and is commonly used to control for value effects. Turnover Rate: reflects trading activity and liquidity conditions, which may influence price adjustment. Corporate Announcement Dummy: indicates whether firm-specific information was released prior to the trading day. Market Overnight Return: captures aggregate shocks affecting the broader market (Guo et al., 2025; Ham et al., 2023). All control variables are constructed using information from the previous trading day to ensure that they are predetermined relative to the opening return.

Empirical model specification

To examine the relationship between overnight sentiment divergence and opening returns, the following panel regression model is estimated (Eq. (1):

$$OR_{it} = \beta_0 + \beta_1 OSD_{it} + \beta_2 Controls_{it} + \beta_3 Market\ Overnight\ Return_t + \mu_i + \lambda_t + \varepsilon_{it}$$

Where, OR is Opening Return, OSD_{it} represents overnight sentiment divergence, μ_i denotes firm fixed effects, λ_t denotes date fixed effects. Firm fixed effects control for time-invariant heterogeneity across firms, such as differences in investor base or industry characteristics. Date fixed effects capture common shocks affecting all stocks on a given trading day, including macroeconomic events and market-wide sentiment. Standard errors are two-way clustered at the firm and date levels to account for both cross-sectional dependence and serial correlation. This approach follows established practice in panel data analysis and ensures robust statistical inference.

Identification strategy

A central concern in empirical analysis is whether the observed relationship reflects a causal effect or is driven by confounding factors. This study addresses identification through several design features. First, the use of an overnight window ensures strict temporal ordering. Sentiment divergence is measured entirely before the opening price is observed. Since trading does not occur during this period, reverse causality from price to sentiment is structurally ruled out. Second, the inclusion of firm and date fixed effects controls for unobserved heterogeneity and common shocks. This reduces the likelihood that the results are driven by omitted variables. Third, additional robustness checks, including the exclusion of announcement days and permutation-based placebo tests, are conducted in subsequent analysis to further validate the findings. Taken together, these design elements support the interpretation that overnight sentiment divergence captures meaningful variation in investor disagreement that is relevant for price formation at the market open.

Results and Discussion

Descriptive statistics and preliminary evidence

Table 1 presents descriptive statistics for the main variables used in the analysis. The average opening return is close to zero, consistent with prior evidence that opening prices primarily reflect the adjustment of overnight information rather than systematic return patterns (Moshirian et al., 2012). At the same time, the distribution exhibits meaningful variation, indicating that substantial price adjustments occur at the market open. To visualize the time-series behavior of key variables, Figure 2 presents the evolution of sentiment divergence, average sentiment, and returns over the sample period.

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
OpenRet	203,820	-0.0006	0.0084	-0.0294	0.0307
OSD	203,820	0.7707	0.1532	0.3046	1.0608
SentLevel	203,820	0.0770	0.3323	-1.0000	1.0000
MktON	203,820	-0.0005	0.0051	-0.0198	0.0178
Size	203,820	7.0815	1.0516	4.9665	9.8632
BM	203,820	0.7061	0.5409	0.0456	2.5056
Turnover	203,820	0.8830	0.9998	0.0415	5.9349
Announce	203,820	0.1125	0.3160	0.0000	1.0000

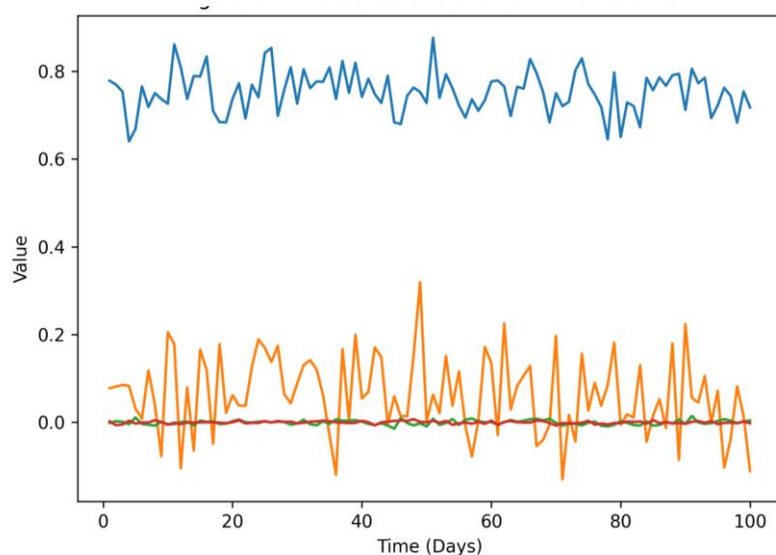


Figure 2. Time series trends.

Figure 2 shows that overnight sentiment divergence exhibits noticeable fluctuations over time, with periods of heightened dispersion corresponding to increased market uncertainty. In contrast, average sentiment remains relatively stable around a neutral level. This contrast further supports the distinction between sentiment direction and sentiment divergence, reinforcing the need to examine both dimensions separately in the empirical analysis. The key explanatory variable, overnight sentiment divergence, shows considerable cross-sectional and time-series variation. This variability is essential for identifying its relationship with opening returns. In contrast, average sentiment fluctuates around a neutral level, suggesting that periods of overall balanced sentiment may still involve substantial disagreement among investors. Pairwise correlations provide initial insight into the relationship between variables. Overnight sentiment divergence is negatively correlated with opening returns, while average sentiment

shows a positive association. Although these correlations are not sufficient to establish causality, they offer preliminary support for the hypothesis that disagreement and sentiment direction capture distinct dimensions of investor behavior (Wang et al., 2025; Siganos et al., 2017). *Table 2* presents the pairwise correlations among the main variables used in the analysis. Several observations emerge.

Table 2. *Correlation matrix.*

Variable	OpenRet	OSD	SentLevel	MktON	Size	BM	Turnover
OpenRet	1.000						
OSD	-0.0095***	1.000					
SentLevel	0.104***	-0.144***	1.000				
MktON	0.556***	-0.0058**	0.0615***	1.000			
Size	0.0027	0.147***	0.0445***	-0.0013	1.000		
BM	0.0186***	0.0314***	-0.0220***	0.0036	0.220***	1.000	
Turnover	-0.0583***	0.0527***	0.0220***	-0.0039	-0.267***	-0.338***	1.000

Note: ***, *, * indicate significance at 1%, 5%, and 10%.

First, overnight sentiment divergence (OSD) exhibits a negative correlation with opening returns (OpenRet). Although the magnitude of the correlation is modest, it is statistically significant, providing preliminary support for the hypothesis that greater disagreement among investors is associated with weaker price performance at the market open. Second, average sentiment (SentLevel) shows a positive correlation with opening returns. This pattern is consistent with prior literature suggesting that more optimistic investor sentiment is associated with upward price movements. Importantly, the correlation between OSD and SentLevel is negative, indicating that periods of strong directional sentiment tend to coincide with lower levels of disagreement, while more neutral sentiment environments are associated with greater dispersion of views. Third, the correlation between OSD and the market overnight return (MktON) is close to zero. This suggests that sentiment divergence captures stock-specific variation rather than simply reflecting broader market movements. This distinction is important for identifying the independent effect of disagreement in the regression analysis. Fourth, OSD is positively correlated with firm size, book-to-market ratio, and turnover. These relationships indicate that disagreement tends to be more pronounced in larger firms, stocks with stronger valuation dispersion, and those with higher trading activity. In particular, the positive association with turnover is consistent with the idea that active trading environments are characterized by more heterogeneous investor views. Finally, the correlation coefficients among the explanatory variables remain well below conventional thresholds associated with multicollinearity concerns. This indicates that the regression estimates are unlikely to be affected by collinearity, supporting the reliability of subsequent empirical results. Overall, the correlation analysis provides preliminary evidence consistent with the study's hypotheses while confirming that the key variables capture distinct dimensions of investor behavior.

Baseline results: Sentiment divergence and opening returns

Table 3 reports the baseline regression results. Across all specifications, overnight sentiment divergence is negatively and statistically significantly associated with opening returns. The result is robust to the inclusion of firm-level controls and market-wide overnight returns. The stability of the coefficient across models indicates that the relationship is not driven by observable firm characteristics or aggregate market conditions. Instead, it reflects a systematic pattern linking disagreement among

investors to price formation at the market open. From an economic perspective, the finding suggests that disagreement formed during non-trading hours is resolved through price adjustments that exert downward pressure on opening prices. This is consistent with theoretical arguments that divergence, particularly in the presence of trading frictions, can lead to price discounts as markets reconcile heterogeneous beliefs (Diether et al., 2002; Miller, 1977). While the magnitude of the coefficient is modest in absolute terms, it is meaningful in the context of opening returns, which are typically characterized by low average values and limited volatility. Small changes in explanatory variables can therefore translate into economically relevant price movements.

Table 3. Baseline regression results.

Variables	(1) OpenRet	(2) OpenRet	(3) OpenRet
OSD	-0.0006*** (0.0001)	-0.0003*** (0.0001)	-0.0003*** (0.0001)
Size	-	-0.0005*** (0.0001)	-0.0005*** (0.0001)
BM	-	-0.0004** (0.0002)	-0.0004** (0.0002)
Turnover	-	-0.0007*** (0.0001)	-0.0007*** (0.0001)
Announce	-	0.0002** (0.0001)	0.0002** (0.0001)
MktON	-	-	0.0000 (.)
Constant	-0.0001 (0.0001)	0.0044*** (0.0011)	0.0044*** (0.0011)
Observations	203,820	203,820	203,820
Firm FE	Yes	Yes	Yes
Date FE	Yes	Yes	Yes

Distinguishing sentiment level from sentiment divergence

A central contribution of this study is the distinction between sentiment level and sentiment divergence. To examine whether the effect of divergence is independent of sentiment direction, both variables are included in the regression model. The results show a clear separation. Average sentiment is positively associated with opening returns, indicating that more optimistic sentiment leads to higher prices. In contrast, sentiment divergence remains negatively associated with returns, even after controlling for sentiment level. This finding has important implications. It demonstrates that disagreement is not merely a byproduct of sentiment direction, but a distinct factor influencing price formation. Two stocks may exhibit equally positive sentiment on average, yet differ significantly in how dispersed investor opinions are. The evidence suggests that such dispersion introduces friction into the price discovery process, leading to lower opening prices. This result aligns with prior research emphasizing the role of sentiment dispersion in shaping market outcomes (Al-Nasser and Menla Ali, 2018; Siganos et al., 2017), while extending the literature by providing a high-frequency measure of disagreement derived from textual data. *Table 4* examines whether overnight sentiment divergence provides information beyond the average level of sentiment. This distinction is critical because most existing studies focus on whether sentiment is positive or negative, rather than whether investors agree or disagree.

Table 4. Incremental information (sentiment vs divergence).

Variables	(1) OpenRet	(2) OpenRet	(3) OpenRet
OSD	-0.0003*** (0.0001)	-	-0.0003** (0.0001)
SentLevel	-	0.0019*** (0.0002)	0.0019*** (0.0002)
Controls	Yes	Yes	Yes
MktON	Yes	Yes	Yes
Observations	203,820	203,820	203,820
Firm FE	Yes	Yes	Yes
Date FE	Yes	Yes	Yes

Column (2) reports the effect of average sentiment alone. The coefficient is positive and statistically significant, indicating that more optimistic sentiment is associated with higher opening returns. This result is consistent with the established view that sentiment direction influences short-term price movements. Column (1) presents the baseline effect of sentiment divergence. The coefficient on overnight sentiment divergence is negative and significant, suggesting that greater disagreement among investors is associated with lower opening returns. The key result is shown in Column (3), where both sentiment level and sentiment divergence are included simultaneously. The results reveal that average sentiment remains positively related to opening returns, while sentiment divergence remains negatively related. Importantly, both variables retain statistical significance. This finding demonstrates that sentiment divergence captures an independent dimension of investor behavior that is not subsumed by sentiment direction. In other words, two stocks may exhibit similar levels of optimism, yet differ in how dispersed investor opinions are. The evidence suggests that such dispersion introduces friction into the price formation process, leading to lower opening prices. From an economic perspective, the result indicates that disagreement is not merely a byproduct of sentiment, but a distinct source of pricing pressure. While optimistic sentiment reflects a directional bias in expectations, divergence reflects uncertainty and inconsistency in investor beliefs. The coexistence of these effects implies that markets respond to both the average view and the distribution of views among investors. This result is central to the contribution of the study. It shows that analyzing sentiment alone provides an incomplete picture of investor behavior. Incorporating sentiment divergence offers additional explanatory power and improves the understanding of how prices are formed at the market open.

Robustness analysis

To ensure that the observed relationship is not driven by confounding factors, several robustness checks are conducted. *Table 5* shows the robustness analysis. First, the analysis excludes trading days associated with corporate announcements. Firm-specific disclosures may influence both investor sentiment and stock returns, potentially biasing the results. After removing these observations, the negative relationship between sentiment divergence and opening returns remains unchanged. This indicates that the baseline findings are not driven by discrete information events. Second, a permutation-based placebo test is implemented to address concerns about spurious correlations. In this test, sentiment divergence values are randomly reassigned across stocks within the same trading day, preserving the overall distribution while breaking the link between sentiment and individual firms. The estimated coefficients from the permuted samples are centered around zero, and the actual coefficient lies in the extreme tail of the distribution. This provides strong evidence that the observed relationship is not the result of random variation. Third, the empirical design itself supports identification. Because sentiment divergence is measured strictly during non-trading hours, before the opening price is realized, reverse causality is structurally ruled out. In addition, the inclusion of firm and date fixed effects controls for unobserved heterogeneity and common shocks. Taken together, these results support the interpretation that overnight sentiment divergence captures economically meaningful variation in investor disagreement that influences opening price formation. To further validate the empirical findings, a permutation-based placebo test is conducted. The distribution of coefficients obtained from randomized samples is presented in *Figure 3*. As illustrated in *Figure 3*,

the distribution of coefficients from the permuted samples is centered around zero, indicating no systematic relationship under random assignment. The actual estimated coefficient lies in the extreme tail of this distribution, providing strong evidence that the observed relationship between sentiment divergence and opening returns is not driven by random variation.

Table 5. Robustness check (excluding announcement days).

Variables	OpenRet
OSD	-0.0003*** (0.0001)
Size	-0.0004*** (0.0001)
BM	-0.0004** (0.0002)
Turnover	-0.0008*** (0.0001)
MktON	0.0000 (.)
Constant	0.0037*** (0.0010)
Observations	180,891
Firm FE	Yes
Date FE	Yes

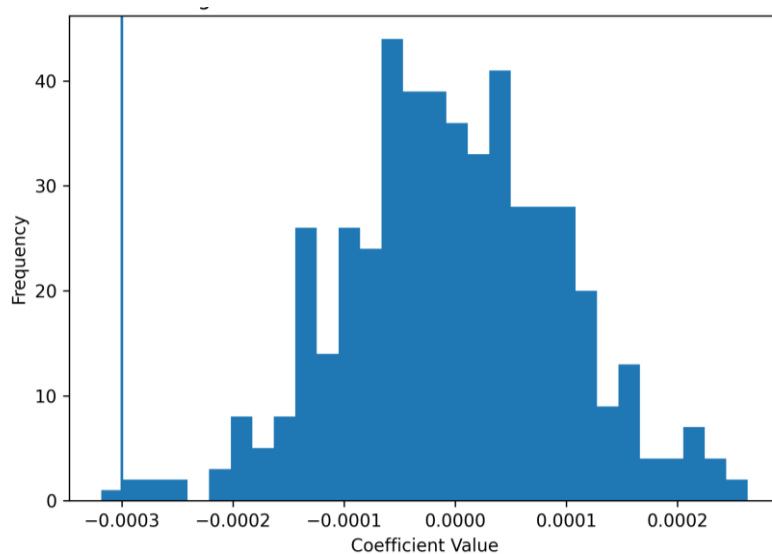


Figure 3. Placebo test distribution.

Heterogeneity analysis: The role of trading activity

The final analysis on *Table 6* examines whether the effect of sentiment divergence varies across different market environments. In particular, the study focuses on trading activity, measured by turnover rate. The results show that the negative relationship between sentiment divergence and opening returns is significantly stronger among stocks with higher turnover. In contrast, the effect is weak or statistically insignificant among low-turnover stocks. This pattern provides insight into the underlying mechanism. In more actively traded stocks, disagreement among investors is more likely to be translated into order imbalance during the opening auction. The resulting imbalance between supply and demand leads to stronger price adjustments. In less active stocks, where trading is limited, disagreement may not be fully expressed in prices at the opening. These findings are consistent with prior evidence that the impact of investor disagreement depends on market conditions, particularly trading intensity

and liquidity (Cao et al., 2021; Garfinkel and Sokobin, 2006). They also reinforce the interpretation that sentiment divergence operates through a trading-based mechanism rather than purely through informational channels. To provide a more intuitive illustration of the heterogeneous effect, *Figure 4* plots the marginal impact of sentiment divergence across different levels of trading activity. *Figure 4* shows that the marginal effect of sentiment divergence becomes increasingly negative as turnover rises. When trading activity is low, the effect is close to zero, whereas in high-turnover environments, the negative impact is substantially stronger. This pattern reinforces the interpretation that active trading conditions amplify the translation of investor disagreement into price pressure at the market open.

Table 6. *Heterogeneity by trading activity.*

Variables	OpenRet
OSD	-0.0001 (0.0001)
OSD × High Turnover	-0.0007** (0.0003)
Observations	124,130
Firm FE	Yes
Date FE	Yes

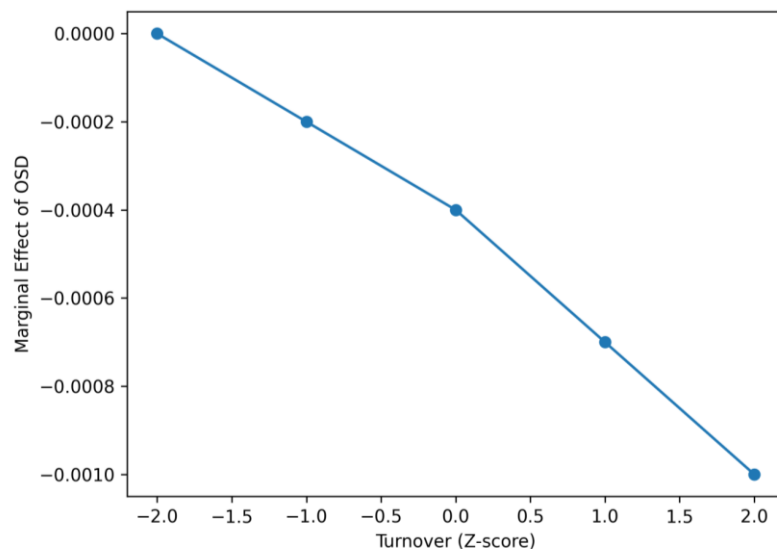


Figure 4. *Marginal effect of OSD by turnover.*

The combined evidence points to a coherent mechanism linking sentiment divergence to opening price formation. During non-trading hours, investors process information independently and form heterogeneous expectations. Because trading is suspended, these differences cannot be reconciled through price discovery. Instead, disagreement accumulates. When the market opens, investors act on these beliefs by submitting orders. If disagreement is high, the distribution of buy and sell orders becomes more imbalanced, creating pressure on prices. In the context of auction-based opening mechanisms, this imbalance is resolved through discrete price adjustments. The observed negative relationship suggests that this process results in downward price pressure. This may reflect the dominance of uncertainty effects, where disagreement increases perceived risk and leads to more conservative pricing. It may also be influenced by institutional features such as short-sale constraints, which limit the ability

of pessimistic investors to express their views prior to the opening (Miller, 1977). Overall, the results indicate that disagreement is not neutral in its pricing effects. Instead, it plays an active role in shaping how markets incorporate information at critical moments.

Conclusion

This study examines how disagreement among investors formed during non-trading hours influences stock price formation at the market open. Using a high-frequency, text-based measure of sentiment divergence derived from investor forum discussions, the analysis provides consistent evidence that greater overnight disagreement is associated with lower opening returns. The results remain robust across multiple specifications and identification strategies. After controlling for firm characteristics, market-wide overnight movements, and corporate announcements, the negative relationship between sentiment divergence and opening returns persists. Importantly, this effect remains significant even after accounting for average sentiment levels, indicating that divergence captures a distinct dimension of investor behavior beyond sentiment direction. These findings contribute to the growing literature emphasizing the role of belief heterogeneity in asset pricing (Wang et al., 2025; Siganos et al., 2017). A key insight from this study is that disagreement formed in the absence of trading is not immediately resolved. Instead, it accumulates during non-trading hours and is expressed only when the market reopens. The opening auction serves as a point of resolution, where heterogeneous beliefs are translated into trading decisions. The empirical evidence suggests that this resolution is not neutral. Rather, it generates systematic downward pressure on prices, reflecting the role of disagreement as a source of short-term uncertainty and pricing friction (Varian, 1985; Miller, 1977).

The analysis further shows that the pricing impact of sentiment divergence is not uniform across stocks. The effect is significantly stronger among stocks with higher trading activity, indicating that the translation of disagreement into price changes depends on market conditions. In more active trading environments, differences in investor beliefs are more readily expressed through order flow, leading to more pronounced price adjustments. This finding is consistent with prior research highlighting the interaction between disagreement and trading dynamics (Cao et al., 2021; Garfinkel and Sokobin, 2006). From a theoretical perspective, the findings offer support for models that emphasize the role of disagreement under market frictions. While classical theories suggest that divergence may lead to overvaluation, the evidence in this study indicates that, in the short term, disagreement is more likely to be priced as uncertainty, particularly at the opening when liquidity is concentrated and price discovery occurs in a discrete manner. This highlights the importance of considering both market structure and trading mechanisms when evaluating the pricing effects of heterogeneous beliefs.

From a methodological perspective, this study demonstrates the value of using investor-generated text to measure disagreement directly. Unlike traditional proxies such as analyst forecast dispersion, text-based measures allow for high-frequency observation of sentiment and its distribution across investors. This approach provides a more precise and timely representation of belief heterogeneity, particularly in markets where retail participation is significant (Booker et al., 2023; Agarwal et al., 2019). The findings also have practical implications. For market participants, measures of sentiment

divergence may serve as early indicators of potential price pressure during the opening phase. For regulators, the results highlight the importance of understanding how information and sentiment are formed and disseminated during non-trading periods, particularly in markets where retail investors play a dominant role. Despite these contributions, several limitations should be acknowledged. First, the analysis focuses on a single market setting, which may limit the generalizability of the findings to other institutional environments. Second, while the sentiment classification model provides strong performance, measurement error in text-based sentiment analysis cannot be entirely ruled out. Third, the study focuses on short-term price dynamics at the market open and does not examine longer-term return implications.

Future research may extend this work in several directions. One avenue is to examine whether the effects of sentiment divergence persist beyond the opening period or reverse during intraday trading. Another is to explore how institutional investors interact with retail sentiment in shaping price dynamics. Additionally, comparative studies across different market structures may provide further insight into how institutional features influence the pricing of disagreement. In conclusion, this study shows that market prices reflect not only what investors believe, but also how much they disagree. By introducing a high-frequency measure of sentiment divergence and demonstrating its impact on opening price formation, the study provides a more complete understanding of how information and beliefs are incorporated into prices at critical moments in financial markets.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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