The Role of Social Media Signals in QQQ Investing Before and During CES

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Abstract. In this study, the impact of social media signals on investor sentiment and investment behavior in the Invesco QQQ Trust (QQQ) prior to and during the Consumer Electronics Show (CES) is examined. Utilizing a mixed-method approach, we combine a survey-based experiment with extensive sentiment analysis of Reddit posts. The survey evaluates how risk signals are interpreted at the individual level and how that affects investment choices, while automated sentiment scoring using large language model (LLM) APIs records investor sentiment related to CES in real time. According to regression analysis, QQQ investment amounts in low-, medium-, and high-risk scenarios are significantly impacted by social media risk signals. More specifically, lower investment is always the result of higher perceived risk. The results show how social media-amplified event-driven sentiment affects investor behavior and ETF market dynamics. Giving investors and policymakers insights into market informational efficiency during significant technology events, this study adds to the body of knowledge on behavioral finance, event studies, and social media-driven financial decision-making.

Keywords: investment, sentiment analysis, QQQ, social media.

1 Introduction

A significant information source for investors in recent years has been social media. In addition to sharing news, websites like Reddit and Twitter offer real-time insights into investor sentiment and risk perception. Social media signals are becoming more and more significant in reshaping investment behavior and asset prices by influencing investors' expectations. In technology-focused markets, where sentiment shifts triggered by high-profile events like CES can result in noticeable market reactions, this relationship is especially important.

CES, one of the most important international technology conferences, presents fresh ideas and strategic narratives that have a big impact on how the market views the technology industry. The Nasdaq-100 index, which is heavily weighted toward large-cap

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technology companies, is tracked by the Invesco QQQ ETF (QQQ), making it extremely vulnerable to changes in sentiment surrounding CES.

By methodically examining how CES-related risk signals, as communicated through social media, impact QQQ's market dynamics, this study seeks to fill a gap in the literature. We use a mixed-approaches strategy, integrating financial data with quantitative analysis of Reddit post scraping. We measure investor sentiment and perceived risk prior to and following CES events using sentiment analysis using LLM APIs. We also conduct a survey experiment to investigate how individual investors perceive and respond to CES-related social media signals when choosing which ETFs to invest in.

This study adds to three important areas of the literature by combining primary experimental evidence with secondary social media data:

1. Examining how social media signals from major technology events like CES influence retail investors' risk perceptions.
2. Exploring how these perceptions shape investors' decisions.
3. Investigating how these investment decisions subsequently affect stock market fluctuations, particularly in the context of ETFs.
4. The findings will provide valuable insights into the informational efficiency of markets during event-driven periods and shed light on the role of investor psychology in shaping ETF investments.

2 Literature Review

2.1 Event-Induced Market Response

When significant events occur that cannot be explained by fundamentals, financial markets usually react strongly. The methodological foundation for event studies was laid by Mittal and Goel (2021), who also showed how crucial it is to account for systematic factors when separating out the effects of an event[1].While Chen, Li, and Wang (2022) used search intensity as a stand-in for investor attention to events, Jiang and Xu (2023) found that media tone has a significant impact on stock returns[2][3].The significance of event-driven anomalies for ETFs was further examined by Silva and Duarte (2021)[4]. The Consumer Electronics Show (CES) is a major platform for the technology industry to unveil innovations and strategic signals. Liu and Park (2024) emphasized how media exposure influences investment flows, while Patel and Kumar (2023) showed that the introduction of new products produces abnormal returns[5][6]. As a result, CES serves as a "sentiment amplifier," and QQQ is especially sensitive to CES-related news and investor reactions due to its heavy weighting in technology firms.

2.2 Investor Sentiment and Risk Perception

One well-established factor influencing market volatility is investor sentiment. Sun and Zhao (2022) connected investor attention to trading behavior, while Baker and Huang (2021) demonstrated that sentiment explains variance in cross-sectional returns[7][8]. These dynamics have been exacerbated by social media, as research shows that sites

such as Reddit and Twitter send signals that forecast short-term profits[9][10]. Risk perception is an ancillary dimension that directly impacts investing decisions. Recent behavioral finance research shows that investors' subjective views of risk and their emotional states play a pivotal role in financial decision-making[11][12]. Experimental evidence further indicates that framing can systematically shift people's judgments under uncertainty, and that perceived risk significantly alters investors' willingness to invest[13][14]. In the context of CES, investors' perceptions of uncertainty and opportunity directly affect QQQ responses [13][14].

2.3 Automated Sentiment Scoring with APIs

Researchers can now use an API-based sentiment and risk score instead of reading and analyzing material by hand. APIs increasingly employ transformer-based models such as FinBERT and related BERT variants to provide consistent sentiment and risk ratings for financial text and social media posts[15][16]. This makes it possible to accurately measure a lot of CES-related debates. The strategy is based on past studies that used automated sentiment indicators to explain returns and volatility [2][3]. This study obtains CES's "real-time" perspective on platforms such as Reddit through API scoring, eliminating the necessity to develop proprietary NLP techniques.

2.4 Survey Experiments for Risk Perception

APIs show us how the public as a whole feel, while surveys show us how each investor understands and reacts to CES-related signals. Recent survey-based studies emphasize the importance of investor surveys for assessing confidence and show that expectations elicited from such surveys are linked to subsequent stock returns[17][18]. Recent work in behavioral finance also documents that subjective emotions and cognitive framing significantly influence risk perception[11][12]. Survey- and vignette-based designs have therefore become a standard methodology for assessing perceptions of investment risk in controlled environments[14]. This study diminishes measurement error and enhances construct validity by integrating API-based sentiment scoring with survey-derived data. By connecting individual-level interpretations with aggregate sentiment trends, the dual approach gives us a more thorough understanding of how CES-driven signals affect QQQ.

2.5 Synthesis and Research Gap

In conclusion, three key insights are suggested by the literature. First, financial market behavior is greatly influenced by event-driven sentiment, with CES acting as a hub for attention in the technology industry. Second, both risk perception and investor sentiment are important behavioral drivers, especially in retail-driven contexts like social media. Third, survey experiments and API-based tools offer complementary approaches for measuring and verifying the impact of event-driven sentiment. Few studies systematically combine event-driven sentiment (CES), ETF-level responses (QQQ), and dual-method evidence (API + surveys), despite the growing interest in social media

finance. By filling this knowledge gap, the current study advances our knowledge of how well ETFs convey information during significant technological events and how psychology influences market dynamics.

3 Methodology

In order to examine how social media risk signals affect investors' perceptions of risk and financial decision-making, this study uses a mixed-method approach that incorporates both primary and secondary data.

Primary Data (Survey Experiment). We created a survey experiment in which participants are shown news clips that depict low-, medium-, and high-risk situations. Respondents are asked to assess (i) their perceived risk and (ii) their investment preferences, including the amount they would allocate to a particular asset, while posing as investors making decisions with their own funds. Because of this design, we can measure directly how risk signals that are communicated through narratives akin to those found on social media influence investor sentiment and behavior on an individual basis.

Secondary Data (Social Media and Financial Markets). We gathered Reddit posts that mentioned CES and the technology industry during particular time windows in order to support the experimental data. A large language model API is used to assign a risk score to each post, and average sentiment scores are calculated for each window. Regression analyses are then conducted by comparing these scores to current financial data (such as the prices, returns, and volatility of the Invesco QQQ ETF). This method examines if sentiment on social media is statistically related to changes in the market.

By using both of these methods, the study makes sure that it is both externally valid (by using real-world data) and internally valid (by using controlled survey manipulations). The dual method makes cross-validation possible: the survey finds out how individuals respond to risk signals, and the link between social media and financial data checks to see if these patterns hold true in the real market. Together, they create a strong framework for judging how well social media opinion can predict changes in stock prices and help people decide where to put their money.

4 Results

The linear regression study examined the impact of social media risk signals on investment outcomes, concentrating on three risk levels: low, medium, and high. The information was collected from a new survey and looked at by the linear regression model. We verified the F-test, R-squared (R2), and VIF values for each model to make sure it was valid and to see if there was multicollinearity. The F-test for all three models was statistically significant ($P<0.05$), which suggests that there was a linear relationship between the independent and dependent variables and that the overall regression coefficients were not zero. The VIF values for all models were less than 10, which suggests that there aren't any big difficulties with multicollinearity. This signifies that the models are constructed well.

4.1 Model 1: The Impact of Low-Risk Signals on Investment Amount

As shown in Figure 1, a linear regression was performed to estimate the amount_LowRisk using the risk_LowRisk signal. The model formula is y = 754.898 - 86.107 * risk_LowRisk.

- **Regression Coefficients:** The non-standardized coefficient (B) for risk_LowRisk was -86.107, and the standardized coefficient (Beta) was -0.4507.
- **Significance:** The P-value was 0.000***, indicating that risk_LowRisk is a statistically significant predictor of amount_LowRisk.
- **Model Fit:** The R2 value was 0.203, suggesting that approximately 20.3% of the variance in amount_LowRisk can be explained by risk_LowRisk.

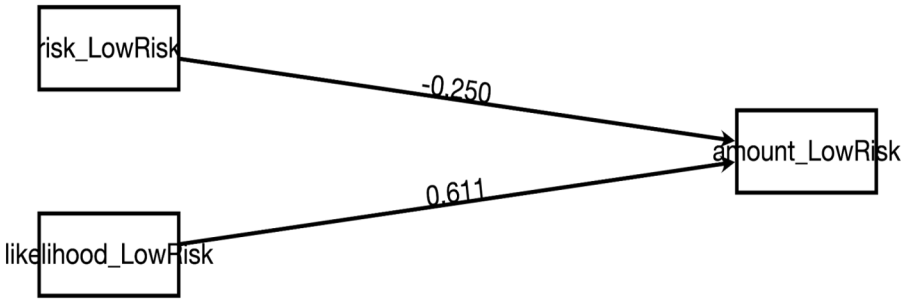

Fig. 1. Fit of the Linear Regression Model for Low-Risk Signals

4.2 Model 2: The Impact of Medium-Risk Signals on Investment Amount

As shown in Figure 2, a linear regression was performed with amount_MediumRisk as the dependent variable and risk_MediumRisk and likelihood_MediumRisk as the independent variables. The resulting model formula is y=14.089 - 15.867 *risk_MediumRisk* + *78.109*likelihood_MediumRisk.

- **Regression Coefficients:** For risk_MediumRisk, the standardized coefficient (Beta) was -0.108, while the non-standardized coefficient (B) was -15.867. For likelihood_MediumRisk, the standardized coefficient (Beta) was 0.694 and the non-standardized coefficient (B) was 78.109.
- **Significance:** It is a statistically significant predictor of amount_MediumRisk, as evidenced by the likelihood_MediumRisk P-value of 0.000***. Nonetheless, risk_MediumRisk's P-value of 0.148 indicates that it is not a significant predictor in this model and is not statistically significant (P>0.05).
- **Model Fit:** The independent variables in this model can account for roughly 56.2% of the variance in amount_MediumRisk, according to the R2 value of 0.562.

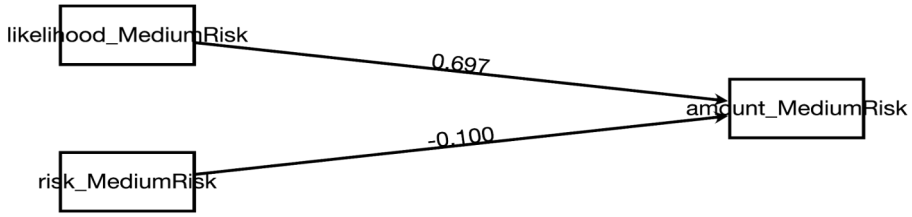

Fig. 2. Model Path Diagram for Medium-Risk Signals

4.3 Model 3: The Impact of High-Risk Signals on Investment Amount

As shown in Figure 3, a linear regression model was used to examine the effect of risk_HighRisk on amount_HighRisk. The model formula is y=719.434 - 66.994*risk_HighRisk80.

- **Regression Coefficients:** The non-standardized coefficient (B) for risk_HighRisk was -66.994, and the standardized coefficient (Beta) was -0.541.
- **Significance:** The P-value was 0.000***, indicating that risk_HighRisk is a statistically significant predictor of amount_HighRisk.
- **Model Fit:** The R2 value was 0.292, suggesting that approximately 29.2% of the variance in amount_HighRisk can be explained by risk_HighRisk.

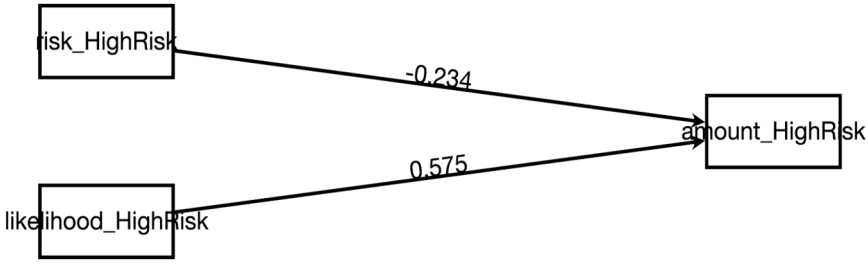

Fig. 3. Fit of the Linear Regression Model for High-Risk Signals

5 Discussion

The study's findings offer compelling proof that social media signals surrounding CES have a big impact on QQQ investor behavior. First, the regression results show that lower investment allocations are associated with higher perceived risk, which is consistent with behavioral finance theories of risk aversion. Secondly, the medium-risk condition emphasizes the significance of likelihood assessments by implying that investors consider the perceived probability of outcomes in addition to the degree of risk when making decisions.

Our findings are in line with recent risk perception frameworks and Baker and Huang (2021)'s investor sentiment theory when compared to earlier research[11][8]. Additionally, CES's amplification effect is consistent with the findings of Patel and Kumar

(2023), who discovered that significant innovation events cause unusual market reactions[6]. Crucially, we fill a methodological gap by combining surveys and sentiment analysis, yielding stronger results than previous single-method research.

Practically speaking, the findings indicate that fund managers and ETF investors should keep a close eye on social media activity surrounding CES since it offers indicators of short-term volatility and investor flows. Policymakers might also need to think about how market stability is impacted by the quick dissemination of narratives driven by sentiment, especially during times when events are driving the market.

6 Limitations

Even though this study provides valuable insights, it should be noted that it has certain limitations. First, only Reddit posts were used for data collection, which might not adequately represent the range of investor sentiment on sites like Twitter, StockTwits, or financial blogs. Second, sentiment analysis was based on pre-existing API models (such as FinBERT and VADER), which may not adequately capture the nuances of financial language in CES-related conversations despite being validated. Third, there is uncertainty regarding whether the results apply to other significant industry conferences or macroeconomic events because the analysis's temporal scope was restricted to CES events. Lastly, although the survey experiment is helpful in determining mechanisms, it is limited by sample size and fictitious scenarios that might not accurately represent investor behavior in the real world.

7 Conclusion

This study shows that investor sentiment, risk perception, and QQQ investment behavior are all impacted measurably by social media signals related to CES. The study offers both macro-level proof of sentiment-market relationships and micro-level insights into how investors interpret and react to CES-related signals by combining survey experiments with API-driven sentiment analysis. Regression model results demonstrate that perceived risk continuously lowers investment levels, with high-risk situations showing the strongest effects. Medium-risk signals emphasize even more how likelihood judgments influence investment choices.

The results support the idea that significant technological events influence financial markets' sentiment, particularly for exchange-traded funds (ETFs) that have a significant amount of exposure to the tech industry. Social media amplifies changes in risk perception and investment flows in addition to acting as a channel for information. In order to capture complex investor sentiment, future research should look at cross-market spillover effects, use more sophisticated natural language processing techniques, and go beyond Reddit to encompass other platforms. Practically speaking, these insights are helpful to investors who want to predict volatility, ETF managers who want to comprehend investor flows, and policymakers who are worried about market stability in the era of digital communication.

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