Asian Journal of Empirical Research
Volume 15, Issue 1 (2025): 33-39

Investor sentiment and stock returns: Examining TAIEX performance with and without the impact of COVID-19

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Article History
Received: 6 February 2025
Revised: 31 March 2025
Accepted: 21 April 2025
Published: 7 May 2025

Keywords
COVID-19
Investor sentiment
Margin financing and securities lending balance ratio
Market turnover rate
Number of active traders.

ABSTRACT
This study examines the impact of investor sentiment on Taiwan's stock market (TAIEX) returns. We analyze two periods: 2007–2019 (pre-COVID-19) and 2007–2023 (including COVID-19), utilizing three sentiment proxies—margin financing and securities lending balance ratio, market turnover rate, and the number of active traders—along with a composite sentiment index to explore their contemporaneous, predictive, and lagging relationships with TAIEX returns. Empirical results reveal that the margin financing and securities lending balance ratio, as well as the composite sentiment index, exhibit a significant negative contemporaneous relationship with market returns. In contrast, market turnover and the number of active traders display a positive but statistically insignificant correlation during the COVID-19 period. Predictive analysis indicates that only the margin financing and securities lending balance ratio serves as a reliable predictor of future returns, with higher values associated with lower subsequent returns. Additionally, reverse causality tests show that market turnover and the number of active traders respond positively to past market returns. These findings underscore the critical role of sentiment in shaping market behavior, particularly during periods of market turbulence. They also offer valuable insights for investors and policymakers in refining trading strategies and enhancing risk management, especially during extreme events.

Contribution/Originality: This study constructs a sentiment index incorporating the margin financing balance ratio, market turnover rate, and the number of active traders to examine its contemporaneous, predictive, and reverse relationships with TAIEX returns. It considers the impact of COVID-19 and identifies margin financing balance as a reliable leading indicator of sentiment-driven market behavior.

DOI: 10.55493/5004.v15i1.5373
ISSN(P): 2306-983X / ISSN(E): 2224-4425

How to cite: Tseng, H.-Y., & Li, Y.-S. (2025). Investor sentiment and stock returns: Examining TAIEX performance with and without the impact of COVID-19. *Asian Journal of Empirical Research, 15*(1), 33–39. 10.55493/5004.v15i1.5373

1. INTRODUCTION

Investor sentiment significantly influences stock market fluctuations, particularly during periods of economic uncertainty. The COVID-19 pandemic had a profound impact on global financial markets, including Taiwan's stock market. The Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX) experienced extreme volatility, initially plunging 30.1% from a high of 12,197 points in January 2020 to a low of 8,523 points in March 2020. Subsequent global economic stimulus measures fueled a 118.5% surge, propelling the index to an all-time high of 18,619 points in January 2022, before geopolitical tensions and inflation concerns triggered another 32.2% decline in October 2022.

Retail investors play a dominant role in Taiwan's stock market, accounting for 61% of total trading volume over the past 17 years, surging to 68% during the pandemic. Their sentiment-driven trading behavior has amplified market fluctuations, influenced by major global events such as the 2007–2008 subprime crisis, the 2011 European debt crisis, and the 2022 Russia-Ukraine conflict.

This study investigates the relationship between investor sentiment and TAIEX returns, comparing two periods: 2007–2019 (pre-COVID-19) and 2007–2023 (including the pandemic). We construct a composite sentiment index based on three proxies: margin financing and securities lending balance ratio, market turnover rate, and the number of active traders. This research aims to empirically analyze the impact of investor sentiment indicators on TAIEX returns before and during COVID-19 and provide insights into post-pandemic investment strategies and risk management.

1.1. Behavioral Finance and the Predictability of Returns

Investor sentiment significantly affects stock market fluctuations, especially during periods of uncertainty. Shiller (1981) and Shiller (1984) categorized investors into "smart money" and "ordinary" types, with the latter being more prone to overreacting to market news. This behavioral distinction becomes crucial during crises like the COVID-19 pandemic, when sentiment-driven trading escalates. While Fama (1998) suggests that market overreactions balance out over time, Shefrin (2000) argues that underreactions dominate in the short term and overreactions in the long term, creating predictable market patterns.

The Efficient Market Hypothesis (EMH) assumes rational investors and efficient price formation, but anomalies challenge this view. Behavioral finance highlights how biases like the availability heuristic (Tversky & Kahneman, 1973) and prospect theory (Kahneman & Tversky, 1979) contribute to market inefficiencies, leading to mispricing and volatility, especially during crises. The COVID-19 pandemic, for instance, triggered extreme fluctuations in TAIEX, with panic selling followed by recovery driven by government stimulus and retail speculation.

Market predictability is evident through momentum effects and mean reversion. Investor biases, such as overconfidence (Daniel, Hirshleifer, & Subrahmanyam, 1998) and representativeness bias (De Bondt & Thaler, 1985), lead to mispricing. Studies (e.g., Hsu (2018)) show that surges in retail investor participation often precede market downturns, signaling the importance of sentiment in predicting stock returns.

1.2. Measurement of Investor Sentiment

Investor sentiment can be measured through direct and indirect indicators. Direct indicators include surveys and indexes, such as the Morgan Stanley Investor Confidence Index and Taiwan's e-Stock Investor Sentiment Index. Indirect indicators use financial data, such as financing rates, odd-lot trading, put-call ratios, and the Consumer Confidence Index. Alternative indicators, such as weather and air quality, have also been explored (Hirshleifer & Shumway, 2003; Saunders, 1993).

Recent studies by Hsu (2018) focus on proxies like the number of active investors, which correlates with future returns. This study highlights the number of active investors as a key sentiment indicator, given its strong predictive power for market outcomes.

1.3. Literature Review on Investor Sentiment and Stock Market Returns

Investor sentiment plays a crucial role in stock market dynamics. Key sentiment indicators include the margin balance ratio, market turnover rate, and the number of active investors. Research suggests that these indicators, along with composite sentiment indices, can predict stock returns. This study integrates these proxies to construct a sentiment index and examines its effectiveness in forecasting TAIEX performance during and after the COVID-19 pandemic.

1.3.1. Margin Balance Ratio (RATIO)

The margin balance ratio reflects investor sentiment, with studies (e.g., Cheng and Lin (2010) and Wang (2018)) showing a negative relationship between margin balances and future returns. Higher margin balances often signal better long-term investment opportunities, but can also indicate excessive optimism, which may lead to lower future returns.

1.3.2. Market Turnover Rate (TURNOVER)

Market turnover rate serves as a sentiment proxy. While studies (e.g., Baker and Stein (2004) and Chou, Chang, and Lin (2007)) suggest a negative correlation between turnover rate and future returns, it remains a valuable tool for assessing sentiment and predicting market behavior.

1.3.3. Number of Active Investors (PERSON) = ln(Current Month Active Investors)

Retail investor participation significantly influences Taiwan's stock market, particularly during periods of volatility. Hsu (2018) found that higher participation negatively correlates with future returns, highlighting the role of sentiment-driven trading. The surge in retail investor activity during the COVID-19 pandemic underscores the relevance of this indicator.

1.3.4. Sentiment Index (SENTIMENT) = Simple Arithmetic Average of the Above Three Indicators

Composite sentiment indices, which integrate multiple sentiment proxies, offer a comprehensive view of market sentiment. Studies (e.g., Baker and Wurgler, 2006) show that such indices positively impact short-term returns but negatively predict future stock returns. This research constructs a sentiment index based on margin balance ratio, turnover rate, and the number of active investors to assess its predictive power for TAIEX performance during the pandemic.

By analyzing TAIEX performance before and during the COVID-19 pandemic, this study aims to determine whether investor sentiment remains a key driver of stock returns amidst extreme market fluctuations, providing valuable insights for investors and policymakers in navigating the post-pandemic financial landscape.

2. RESEARCH METHODOLOGY

This study examines two periods: from January 2007 to December 2019 (excluding the COVID-19 period) and from January 2007 to December 2023 (including the COVID-19 period). The research focuses on three sentiment proxies: "Margin Financing and Securities Lending Balance Ratio" (RATIO), "Market Turnover Rate" (TURNOVER), and "Number of Traders" (PERSON). Furthermore, a novel composite sentiment index (SENTIMENT) is constructed by integrating these indicators to analyze the relationships, predictive effects, and significance of these sentiment indicators concerning Taiwan's stock market returns.

2.1. Research Sample Data

This study analyzes two distinct periods: from January 2007 to December 2019 (pre-COVID-19) and from January 2007 to December 2023 (Full Period). The research focuses on three key sentiment proxies: the "Margin Financing and Securities Lending Balance Ratio" (RATIO), the "Market Turnover Rate" (TURNOVER), and the "Number of Traders" (PERSON). Additionally, a composite sentiment index is developed by combining these indicators to investigate their relationships, predictive effects, and significance in forecasting Taiwan's stock market returns.

2.2. Variable Definitions

This study selects three key investor sentiment indicators based on their relevance in capturing market behavior and their established significance in prior research. These indicators include (1) Margin Financing and Securities Lending Balance Ratio (RATIO), (2) Market Turnover Rate (TURNOVER), and (3) Number of Active Traders (PERSON). (4) Composite Sentiment Index (SENTIMENT): To enhance predictive accuracy, we construct a Composite Sentiment Index (SENTIMENT) that aggregates these indicators. This approach allows for a comprehensive analysis of TAIEX performance under different market conditions, both before and during the COVID-19 pandemic.

2.2.1. Margin Financing and Securities Lending Balance Ratio (RATIO)

$$\text{RATIO} = \ln\left(\frac{\textit{Current month's margin financing balance}}{\text{current month's securities lending balance}}\right) \quad (1)$$

Margin financing represents bullish sentiment, as investors borrow funds to buy stocks, while securities lending represents bearish sentiment, as investors borrow stocks to sell short. The balance between these activities reflects market optimism or pessimism.

This study expects an inverse relationship between RATIO and market returns. During market downturns, excessive margin financing can lead to forced liquidations, amplifying selling pressure. Conversely, high levels of securities lending may trigger short squeezes, pushing prices higher. Given the unprecedented market volatility during COVID-19, examining the role of margin financing and securities lending is particularly relevant in understanding shifts in investor sentiment.

2.2.2. Market Turnover Rate (TURNOVER)

$$TURNOVER = \frac{\textit{Current month's stock trading volume}}{\textit{current month's outstanding shares}} \quad (2)$$

Market turnover rate reflects the level of trading activity within a given month and serves as an indicator of investor sentiment. Higher turnover rates typically signal increased speculation and market enthusiasm, whereas lower rates may indicate risk aversion or reduced liquidity.

Empirical studies suggest a positive correlation between turnover rate and concurrent market returns, as higher trading volumes often coincide with bullish market conditions. However, the turnover rate's predictive power for future returns remains inconclusive, with evidence suggesting both positive and negative relationships depending on market conditions. This study explores how trading activity influenced stock returns before and during the COVID-19 crisis, when market participation surged due to increased uncertainty and retail investor speculation.

2.2.3. Number of Traders (PERSON)

$$PERSON = Number\ of\ traders\ in\ the\ current\ month \quad (3)$$

The number of active traders serves as a direct proxy for investor participation and sentiment. A rising number of traders indicates heightened market engagement, often driven by optimism, whereas a decline suggests reduced confidence or risk aversion.

Prior research has shown that increased retail investor participation negatively correlates with future stock returns, implying that heightened sentiment may signal market peaks. During the COVID-19 period, Taiwan's retail investor participation surged, making this variable particularly valuable in assessing how investor behavior shifted before and after the pandemic.

2.2.4. Composite Sentiment Indicator (SENTIMENT)

$$SENTIMENT = \frac{RATIO+TURNOVER+PERSON}{3} \quad (4)$$

To provide a comprehensive measure of investor sentiment, this study constructs a composite sentiment index by taking the simple arithmetic average of the margin balance ratio, market turnover rate, and number of active traders. This methodology is inspired by prior sentiment index models but is tailored to the unique characteristics of the Taiwan stock market and the COVID-19 period.

By incorporating multiple sentiment proxies, this index allows for a more robust analysis of market behavior, particularly in assessing whether investor sentiment remained a key driver of TAIEX fluctuations before and during the pandemic. The findings can offer valuable insights into market psychology, risk management strategies, and post-pandemic investment behavior.

2.2.5. Market return (MR)

$$MR = 100 \times ln\left(\frac{Current\ period\ TAIEX}{previous\ period\ TAIEX}\right) \quad (5)$$

Market return (MR) represents the percentage change in the Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX), which measures the overall market performance in Taiwan.

2.3. Research Model

This study examines the relationship between investor sentiment indicators and market returns using three models, applying simple linear regression analysis.

2.3.1. Model 1: Relationship Between Sentiment Indicators and Current Market Return

$$MR_t = \alpha + \beta_1 Senti_t + \epsilon_t \quad (6)$$

The current market return MR_t will be the dependent variable, while the current investor sentiment indicators $Senti_t$— such as the margin financing and securities lending balance ratio (RATIO), market turnover (TURNOVER), number of traders (PERSON), and the three-in-one composite sentiment index (SENTIMENT) — will be the independent variables. A simple linear regression will be conducted to test whether the defined sentiment indicators can explain the current return to some extent.

Hypothesis H_1: Whether the sentiment indicators have a significant relationship with the current market return.

2.3.2. Model 2: Relationship Between Sentiment Indicators and Next Period's Market Return

$$MR_{t+1} = \alpha + \beta_1 Senti_t + \epsilon_t \quad (7)$$

The current investor sentiment indicators Senti_t — *such as the ratio of margin financing and securities lending balance ratio (RATIO), market turnover (TURNOVER), number of traders (PERSON), and the three-in-one composite sentiment index (SENTIMENT) — will be the independent variables, while the next period's market return* MR_{t+1} will be the dependent variable. A simple linear regression will be conducted to test whether the defined sentiment indicators can explain the next period's return to some extent.

Hypothesis H_2: Sentiment indicators can predict the next period's market return.

2.3.3. Model 3: Relationship Between Market Return and Next Period's Sentiment Indicators

$$Senti_{t+1} = \alpha + \beta_1 MR_t + \epsilon_t \quad (8)$$

The market return MR_t *will be the independent variable, while the next period's investor sentiment indicators* Senti_{t+1} — such as the margin financing and securities lending balance ratio (RATIO), market turnover (TURNOVER), number of traders (PERSON), and the three-in-one composite sentiment index (SENTIMENT) — will be the dependent variables. A simple linear regression will be conducted to test whether the market return has some degree of influence on the defined sentiment indicators for the next period.

Hypothesis H_3: Market returns influence sentiment indicators in the following period.

Each model is tested to assess variations in relationships.

3. EMPIRICAL RESULTS AND ANALYSIS

Regression analysis is conducted separately for the sub-period and the full period to examine these relationships.

3.1. The Relationship Between Sentiment Indicators and Current Market Returns

As shown in Table 1, for both periods, market return (MR) is significantly negatively related to the margin financing and securities lending balance ratio (RATIO) and the three-in-one composite sentiment index (SENTIMENT), which aligns with the expected inverse relationship. Conversely, market return shows a positive but insignificant relationship with market turnover (TURNOVER) and the number of traders (PERSON), consistent with the expected same-direction relationship.

Table 1. Linear regression of market returns on sentiment indicators.

$$MR_t = \alpha + \beta_1 Senti_t + \epsilon_t$$

Panel A Sub-period: January 2007 to December 2019 (Excluding the COVID-19 period)

	Intercept	$Senti_t$				R-sq
		Ratio	Turnover	Person	Sentiment	
Coefficients	4.0137	-0.3860				0.0952
(t-values)	(0.0002)***	(0.0002)***				
Coefficients	-1.4298		0.5138			0.0139
(t-values)	(0.2467)		(0.1429)			
Coefficients	-30.9686			2.2174		0.0045
(t-values)	(0.4110)			(0.4069)		
Coefficients	7.7226				-0.8303	0.0606
(t-values)	(0.0025)***				(0.0029)***	

Panel B Full period: January 2007 to December 2023 (Including the COVID-19 period)

	Intercept	$Senti_t$				R-sq
		Ratio	Turnover	Person	Sentiment	
Coefficients	3.9176	-0.3720				0.0756
(t-values)	(0.0001)***	(0.0001)***				
Coefficients	-0.4579		0.2031			0.0036
(t-values)	(0.5457)		(0.1904)			
Coefficients	-11.2586			0.8186		0.0026
(t-values)	(0.4834)			(0.4677)		
Coefficients	5.3529				-0.5329	0.0279
(t-values)	(0.0141)				(0.0206)**	

Note: (1) MR: Market return, $Senti_t$: Sentiment indicators (i)RATIO: Margin financing and securities lending balance ratio, (ii)TURNOVER: Market turnover, (iii)PERSON: Number of traders, (iv)SENTIMENT: Composite sentiment index.
(2) The model used is: $MR_t = \alpha + \beta_1 Senti_t + \epsilon_t$
(3) The p-values are given in parentheses in the table, *** indicates significance at the 1% level, ** at the 5% level.

3.2. The Relationship Between Sentiment Indicators and Next-Period Market Returns

For the full sample, as shown in Table 2, during the sub-period, market return (MR) exhibits a significant negative relationship with the prior period margin financing and securities lending balance ratio (RATIO) and the prior period composite sentiment index (SENTIMENT), significant at the 1% level. This supports the expected negative relationship and demonstrates significant predictive ability. Furthermore, market return shows a negative relationship with the prior period market turnover (TURNOVER) and the prior period number of traders (PERSON), although these relationships are not statistically significant, as expected.

Table 2. Linear Regression of next-period market returns on sentiment indicators.

$$MR_{t+1} = \alpha + \beta_1 Senti_t + \epsilon_t$$

Panel A Sub-period: January 2007 to December 2019 (Excluding the COVID-19 period)

	Intercept	$Senti_t$				R-sq
		Ratio	Turnover	Person	Sentiment	
Coefficients	3.4613	-0.3196				0.0676
(t-values)	(0.0014)***	(0.0017)***				
Coefficients	2.1051		-0.5489			0.0158
(t-values)	(0.0895)*		(0.1186)			
Coefficients	44.6047			-3.1458		0.0089
(t-values)	(0.2402)			(0.2432)		
Coefficients	8.1742				-0.8700	0.0690
(t-values)	(0.0690)*				(0.0015)***	

Panel B Full period: January 2007 to December 2023 (Including the COVID-19 period)

	Intercept	$Senti_t$				R-sq
		Ratio	Turnover	Person	Sentiment	
Coefficients	3.3021	-0.3003				0.0507
(t-values)	(0.0008)***	(0.0017)***				
Coefficients	0.6962		-0.0660			0.0009
(t-values)	(0.3624)		(0.6736)			
Coefficients	-0.3462			0.0535		0.0000
(t-values)	(0.9830)			(0.9626)		
Coefficients	5.9453				-0.5899	0.0350
(t-values)	(0.0058)***				(0.0095)***	

Note: (1) MR: Market return, $Senti_t$: Sentiment indicators (i)RATIO: Margin financing and securities lending balance ratio, (ii)TURNOVER: Market turnover, (iii)PERSON: Number of traders, (iv)SENTIMENT: Composite sentiment index.
(2) The model used is: $MR_{t+1} = \alpha + \beta_1 Senti_t + \epsilon_t$
(3) The p-values are given in parentheses in the table, *** indicates significance at the 1% level and * at the 10% level.

In the full period, the market return shows a positive relationship with the prior period's number of traders, which contradicts the expected negative relationship. However, the market return exhibits a significant negative relationship with the prior period margin financing and securities lending balance ratio (RATIO) and the prior period composite sentiment index (SENTIMENT), demonstrating predictive ability in line with the expected negative relationship (significant at the 1% level).

3.3. The Relationship Between Market Return and Next Period Sentiment Indicator

3.3.1. Sub-Period

As shown in Table 3, the margin financing and securities lending balance ratio (RATIO) displays an unexpected negative relationship with the prior period market return (MR), significant at the 10% level. Market turnover (TURNOVER) and the number of traders (PERSON) show the expected positive relationship with the prior period market return, both significant at the 1% level, indicating significant predictive power. This suggests that during the sub-period, sentiment indicators like market turnover and the number of traders are clearly influenced by prior market returns. Additionally, the composite sentiment index (SENTIMENT) shows an unexpected positive relationship with the prior period market return, although this result is not statistically significant.

3.3.2. Full Period

After incorporating the four years of the COVID-19 pandemic, the negative relationship between the margin debt-to-market capitalization ratio and the prior period market return becomes insignificant. Meanwhile, the composite sentiment index turns positive but remains insignificant. Both market turnover and the number of traders continue to show the expected positive relationship with the prior period market return, significant at the 1% level. This suggests that, across the full sample period, including both pre- and post-pandemic phases, strong market returns tend to attract subsequent investor participation. This finding may align with the stock market adage: "After three consecutive days of gains, retail investors arrive without being invited."

Table 3. Full-sample linear regression of market returns and next-period sentiment indicators.

$$Senti_{t+1} = \alpha + \beta_1 MR_t + \epsilon_t$$

		Sub-period:2007-2019	Full period:2007-2023
$Senti_{t+1}$		MR_t	MR_t
Ratio(t+1)	Coefficients	-0.1228	-0.0777
	(t-values)	(0.0665)*	(0.1468)
Turnover(t+1)	Coefficients	0.0771	0.1002
	(t-values)	(0.0000)***	(0.0015)***
Person(t+1)	Coefficients	0.0123	0.0132
	(t-values)	(0.0000)***	(0.0024)***
Sentiment(t+1)	Coefficients	-0.0165	0.0091
	(t-values)	(0.5077)	(0.6896)

Note: (1) MR: Market return, $Senti_t$: Sentiment indicators (i)RATIO: Margin financing and securities lending balance ratio, (ii)TURNOVER: Market turnover, (iii)PERSON: Number of traders, (iv)SENTIMENT: Composite sentiment index.
(2) The model used is: $Senti_{t+1} = \alpha + \beta_1 MR_t + \epsilon_t$
(3) The p-values are given in parentheses in the table, *** indicates significance at the 1% level and * at the 10% level.
(4) Sub-period: January 2007 to December 2019 (Excluding the COVID-19 period).
(5) Full period: January 2007 to December 2023 (Including the COVID-19 period).

4. CONCLUSION

This study examines two periods: 2007-2019 (excluding the COVID-19 period) and 2007-2023 (including the COVID-19 period), focusing on three sentiment proxies, margin financing and securities lending balance ratio, market turnover, and the number of active traders. A composite sentiment index is constructed to analyze the causal

relationship and predictive power between sentiment indicators and Taiwan's stock market returns, particularly during the COVID-19 pandemic. This study aims to understand the relationship between sentiment variables and TAIEX returns by examining three models to determine whether sentiment variables exhibit contemporaneous, leading, or lagging relationships with TAIEX returns.

Model 1, which examines the contemporaneous relationship, finds that the margin financing and securities lending balance ratio and the composite sentiment index consistently show the expected inverse relationship with market returns across both periods. Market turnover and the number of active traders show a positive relationship with returns but become insignificant after including the COVID-19 period.

Model 2, which investigates the predictive relationship, shows that only the margin financing and securities lending balance ratio consistently predicts future market returns, with higher ratios linked to lower future returns. This indicator remains significant across both periods. In contrast, market turnover, the number of active traders, and the composite sentiment index do not demonstrate reliable predictive power for future returns.

Model 3, which explores the reverse relationship between market returns and sentiment indicators, finds that both market turnover and the number of active traders are positively related to market returns, indicating that higher returns lead to increased turnover and more active traders in subsequent periods.

In conclusion, the margin financing and securities lending balance ratio and composite sentiment index are effective contemporaneous and leading indicators of market returns, reflecting sentiment's influence. Market turnover and active traders act as lagging indicators, driven by past market performance, underscoring the importance of sentiment in stock market analysis, especially during significant events like the COVID-19 pandemic. Understanding these dynamics can help investors and policymakers refine trading strategies and enhance risk management approaches.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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