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The Effects of Short Interest on the Likelihood of Short Squeeze

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Abstract

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Our paper investigates the determinants of short squeeze occurrences, a market anomaly wherein rapid price increases force short sellers to cover their positions, amplifying upward momentum. We focus on the predictive role of short interest, investor attention, and institutional ownership, employing rare-event logistic regression to address the infrequency of these events. Our results show that elevated short interest and spikes in investor attention significantly increase the likelihood of a short squeeze, while institutional ownership has a stabilizing effect. These findings suggest that short squeezes are not random episodes but can be systematically anticipated based on observable market signals. The study offers practical implications for traders, risk managers, and regulators seeking to better understand and monitor the conditions under which short squeezes are likely to occur.

Key words

squeeze effect, rare-logit, short interest, investor attention

JEL: G12; G14; G41

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Introduction

Short squeezes represent a significant and increasingly scrutinized market anomaly characterized by rapid price escalations that force short sellers to liquidate their positions at a loss. These events often result in extreme price volatility, challenging the notion of efficient markets and raising important questions about the underlying mechanisms that drive short-squeeze occurrences. While short selling is traditionally viewed as a means to improve price efficiency by incorporating negative information into asset prices (Karpoff and Lou, 2010; Saffi et al., 2011), excessive short positioning can create conditions conducive to a short squeeze, particularly when combined with heightened investor attention and liquidity constraints. The GameStop (GME) short squeeze of early 2021 highlighted the market-wide impact of such events, bringing retail investor behavior, social media-driven speculation, and hedge fund risk management strategies into sharp focus (Anand and Pathak, 2022).

Existing literature has examined the conditions that accompany this phenomenon, with a particular emphasis on short interest, market microstructure, and investor sentiment. Prior studies have demonstrated that markets with more lenient short-selling regulations tend to exhibit greater negative skewness in returns, suggesting that short-selling contributes to amplified market volatility (Bris et al., 2007; Garleanu et al., 2021). The effect is particularly pronounced when short interest surpasses a critical threshold, triggering a self-reinforcing feedback loop: as stock prices appreciate, short sellers are forced to cover their positions, leading to further upward pressure on prices (Duffie et al., 2002). Recent evidence suggests that speculative trading behavior, facilitated by online investment communities and social media, might play a key role in amplifying short-squeeze events.

Despite bringing novel insights, the literature lacks a comprehensive framework for systematically predicting short-squeeze occurrences. Most prior research has examined short squeezes as a byproduct of market conditions rather than a definable phenomenon driven by identifiable factors. Additionally, while studies have acknowledged the role of retail speculation in price anomalies (Engelberg et al., 2011; Brochado, 2019), they have not fully explored the extent to which investor attention interacts with short interest to drive squeeze events. Furthermore, the role of institutional investors in moderating or exacerbating these dynamics remains an open question, with some evidence suggesting that institutional ownership stabilizes prices by absorbing liquidity shocks (Orlando, 2022), while others argue that institutional investors may contribute to short squeezes through aggressive risk management strategies (Mitchell, 2022).

Our study aims to address these gaps by systematically analyzing the determinants of short-squeeze occurrences. Specifically, we investigate the role of short interest, investor attention, institutional

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ownership, stock capitalization, market volume, and trading volume in predicting short squeezes. Using a dataset of 70 small-cap stocks traded on the NASDAQ between 2018 and 2021, we employ rare-event and standard logistic regression models and backtesting methodologies to assess the predictive power of these factors. Our research seeks to answer three key questions: (1) What are the factors affecting the short-squeeze occurrence? (2) To what extent do they as leading indicators of short squeeze likelihood? (3) How does investor attention interact with short positioning to influence squeeze dynamics? (4) What role do institutional investors play in either mitigating or exacerbating short squeezes? (5) Is the effect more pronounced during a bullish or bearish trend? By addressing these questions, our study contributes to the growing literature on market anomalies, investor behavior, and financial stability. Understanding the conditions that lead to short squeezes is not only valuable for traders and portfolio managers seeking to navigate volatile market environments but also for regulators aiming to design policies that promote market integrity. Our findings provide empirical evidence that short squeezes are not random events but can be systematically anticipated using a combination of market indicators, behavioral signals, and liquidity constraints.

The paper is structured as follows. Section 2 reviews the relevant literature on short selling, investor attention, and market volatility. Section 3 describes the data and methodology used in our empirical analysis. Section 4 presents the key findings on short squeeze determinants, while Section 5 discusses the robustness of these results and their implications. Finally, Section 6 concludes with recommendations for future research and practical applications of our findings.

1 Literature review

The squeeze effect represents a significant market anomaly in which short sellers are compelled to close their positions due to rapid price appreciation, leading to further price escalations. The theoretical framework behind this phenomenon is deeply rooted in market microstructure, investor behavior, and price formation dynamics. Short selling is often considered a mechanism for improving market efficiency by allowing negative information to be priced into securities (Karpoff and Lou, 2010; Saffi et al., 2011). In theory, short sellers are informed traders who identify mispriced securities and engage in trades that align asset prices more closely with their fundamental values (Boehmer and Wu, 2013). However, the mechanism of short selling introduces inherent risks, particularly when a significant portion of the float is shorted. As Constable (2015) and Mitchell (2022) argue, a squeeze effect can materialize when the supply of available shares is constrained, leading to an amplified demand for stock borrowing and increasing margin requirements, which force short sellers to exit their positions prematurely.

Numerous studies have laid theoretical background to the conditions under which a short squeeze might occur. Bris et al. (2007) and Garleanu et al. (2021) demonstrate that markets with more permissive short-selling regulations tend to exhibit greater negative skewness in returns, implying that short-selling can amplify market volatility. Such an effect becomes particularly pronounced when short interest surpasses a critical threshold, resulting in price inefficiencies and market destabilization. Excessive short positioning can trigger a self-reinforcing feedback loop: as stock prices appreciate, margin calls compel short sellers to close their positions, further driving prices upward (Duffie et al., 2002). In addition to these market mechanics, investor attention has emerged as an indicator associated with short squeezes. Recent evidence suggests that heightened interest in heavily shorted yet lesser-known stocks is often fuelled by discussions on social media and online investment forums, where retail investors exchange insights on market trends and speculative opportunities. Diangson and Jung (2021) examine the 50 most shorted stocks between March 2020 and January 2021, finding that the ease of communication in digital communities enhances investor attention. In turn, it leads to increased trading activity, which can exert a substantial influence on subsequent stock price movements. However, these studies examined attention rather as a concomitant phenomenon rather than a determinant. Therefore, a more detailed analysis of factors affecting short-squeeze occurrence in advance remains to be accomplished.

Additionally, research has shown that heightened retail investor participation, often facilitated through social media and online forums, amplifies speculative behaviors (Diangson and Jung, 2021). It was notably observed in the GameStop (GME) squeeze of 2021, where retail trading volumes and sentiment-driven strategies played a pivotal role in forcing institutional short sellers to close their positions (Anand and Pathak, 2022). Therefore, the extent to which a squeeze occurs also might depend on the presence of institutional investors. As Orlando (2022) notes, institutional investors exhibit stabilizing effects on asset prices due to their ability to counteract irrational retail trading.

Another important factor with an effect on the likelihood of a short squeeze occurrence might be volume. The relationship between trading volume and stock price volatility is well established (Mahajan et al., 2008; Gallant et al., 2015). Empirical findings indicate that an increase in trading volume—often fueled by speculative retail activity—leads to heightened volatility, which could serve as a precursor to squeeze effects (Han et al., 2022). Furthermore, Google Trends-based sentiment indices have been employed to assess the role of investor attention in stock price dynamics (Engelberg et al., 2011; Brochado, 2019). Findings suggest that sudden surges in search intensity for specific tickers correlate with short-term price appreciation, reinforcing the hypothesis that attention-driven trading

can exacerbate market anomalies. However, these assumptions have not been tested for the anomaly of short squeeze.

Research suggests that the chances of the squeeze phenomenon increase with a smaller market capitalization of a company and fewer outstanding shares. Therefore, the company can easily induce higher volatility. Companies with small market capitalization are more vulnerable to becoming subject to malpractice. Aggarwal and Wu (2006) bring evidence in their study that more than 50% of penny stocks (small market capitalization stocks) might be regularly manipulated with an aim to increase price volatility. Gerace et al. (2014) obtained similar results, where the authors confirm that companies with small market capitalization are more likely to experience higher volatility than stocks of companies with large market capitalization. A study by Huang and Cheng (2015) reports that it is easier to evoke increased stock price volatility for small-cap companies by increasing the trading volume than in the case of large-cap companies. However, research has identified the impact of market capitalization on volatility.

By integrating insights from financial microstructure, behavioral finance, and market volatility studies, this research contributes to a more comprehensive understanding of short squeezes. The theoretical underpinnings suggest that the squeeze effect is not a purely stochastic event but rather might be a predictable outcome driven by specific market conditions, investor behaviors, and structural constraints on short selling. Therefore, a more thorough investigation of the determinants would offer insights for market regulators, institutional investors, and retail traders.

2 Data and methods

2.1 Data

To investigate the determinants of short squeeze occurrences, we construct a dataset comprising 70 small-cap stocks listed on the NASDAQ between March 2018 and March 2021. The selection of small-cap stocks is motivated by prior research indicating that firms with lower market capitalization are more susceptible to price manipulation, heightened volatility, and speculative trading (Aggarwal and Wu, 2006; Gerace et al., 2014). Given that short squeezes are inherently rare events, we employ a binary classification approach, identifying stocks that experienced a short squeeze within the sample period based on three criteria: (i) a sudden and substantial increase in stock price within a short time frame, (ii) a corresponding sharp decline in short interest, and (iii) increased investor attention as measured by online search trends and social media discussions.

The dataset integrates multiple sources to capture both microeconomic firm-level characteristics and macroeconomic market conditions. Stock price data, trading volume, and short interest ratios are obtained from the Morningstar database, while investor attention is proxied using Google Trends data, following the methodology of Bijl et al. (2016). Additionally, institutional ownership data is retrieved from SEC filings, and broader market indicators such as S&P 500 index returns and relative trading volume are sourced from Bloomberg Terminal.

The key outcome variable in this study is Short Squeeze, a binary indicator that takes the value of 1 if a given stock experienced a short squeeze in a particular month and 0 otherwise. The classification is based on a threshold increase in stock price exceeding 30% within a single trading week, a corresponding decline in short interest of at least 20%, and a spike in investor attention exceeding its six-month rolling average. The methodology aligns with previous empirical studies on short-squeeze events (Guimarães and Pannella, 2021; Schultz, 2022). To analyze the primary drivers of short squeeze occurrences, we consider several key variables, drawing from existing financial literature. Short interest represents the proportion of a company's outstanding shares that have been sold short but not yet covered. As previous studies suggest, high short interest can indicate increased vulnerability to a short squeeze, as short sellers may be forced to cover their positions if stock prices rise sharply (Constable, 2015; Mitchell, 2022). Investor attention is proxied using a Google Trends-based index, which measures search intensity for stock tickers. The approach follows previous work showing that heightened retail investor attention correlates with increased trading activity and speculative market behavior (Engelberg et al., 2011; Brochado, 2019). Institutional ownership, measured as the percentage of shares held by institutional investors, is included as a stabilizing factor. Research suggests that higher institutional ownership mitigates market anomalies by absorbing liquidity shocks and reducing extreme price movements (Karpoff and Lou, 2010; Orlando, 2022). Market capitalization, expressed as the natural logarithm of a company's equity value, controls for size-related liquidity effects. Prior studies indicate that firms with smaller market capitalizations are more susceptible to volatility and price manipulation (Aggarwal and Wu, 2006; Gerace et al., 2014). Relative trading volume, defined as the ratio of a stock's trading volume to the average trading volume of the S&P 500 index, serves as an indicator of speculative trading intensity. High relative trading volume has been linked to increased price momentum and market instability, particularly in the presence of heightened retail investor participation (Gallant et al., 2015; Mahajan and Singh, 2008). Market return, represented by the monthly return of the S&P 500 index, accounts for broader market conditions. Previous research has shown that overall market trends can be associated with the occurrence of short-squeeze (Han et al., 2022; Schultz, 2022).

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We conduct summary statistics and correlation analyses to assess the distribution of key variables and identify potential collinearity issues. Table A1 in the Appendix presents the mean, standard deviation, and quartile distributions of the variables, while Table A2 provides a correlation matrix, highlighting relationships between short interest, investor attention, and institutional ownership. Table A3 in the Appendix provides a detailed description of the variables used in the study, including their definitions and data sources.

2.2 Methods

This section describes methods of the likelihood of a short squeeze, an event characterized by a low incident rate. Events with low incidence rates, also known as rare events, pose challenges in empirical studies. To analyze how key factors influence the occurrence of short squeeze effect, logistic regression is well-suited for modeling binary outcomes to test our hypothesis. It captures how changes in independent variables affect the probability of an event, accounting for the nonlinear relationship between predictors and the outcome. In finance, logistic regression is commonly used to analyze firm decisions, risk events, and market anomalies, making it a practical tool for our study.

However, since short squeezes are low-incidence financial anomalies, standard logistic regression may systematically underestimate their probability due to the imbalance between event and non-event observations. To address this limitation, we modify a Rare Event Logit estimator (King & Zeng, 2001), which is designed to improve probability estimation in datasets with imbalanced event frequencies. Standard logistic regression tends to produce biased probability estimates under such conditions. A Rare Event Logit model corrects for that bias and improves prediction accuracy. This adjustment is particularly important for uncommon anomalies like short squeezes, as their occurrence is driven by a combination of several market dynamics. By this approach, we provide a more accurate and robust framework for analyzing the key factors driving short squeeze events.

To capture the likelihood of a short squeeze, we propose two versions of the model: a static model (1) and a dynamic model (2). We consider both the current level of key variables (1) and past values and their changes over time (2). The choice between a static and dynamic specification is motivated by prior research on financial anomalies, which typically account for an investor positioning reflected in short interest levels and institutional investor holding. The static model (1) includes firm variables and macroeconomic factors:

$$p_{i\gamma} = P(shortsqueeze_i = 1)$$

$$= F\gamma\left(\sum_{f=1}^{F}\beta_{f}firms_{i,t}^{f} + \sum_{m=1}^{M}\beta_{m}macro_{c,t}^{m} + \mu_{i} + \theta_{t} + \varepsilon_{i,t}\right).$$
(1)

The dynamic model (2) extends model (1) by incorporating lagged values and changes in firm and macroeconomic variables:

$$p_{i\gamma} = P(shortsqueeze_i = 1)$$
$$= F\gamma \left(\beta_1 \Delta firms_{i,t}^f + \beta_2 firms_{i,t-1}^f + \beta_3 \Delta macro_{i,t}^m + \mu_i + \theta_t + \varepsilon_{i,t}\right),$$
(2)

where the dependent variable $p_{i\gamma}$ represents the likelihood of the squeeze for the company *i* in month *t*. If a company experiences a short squeeze, the dependent variable $p_{i\gamma}$ is denoted by 1. Otherwise, it takes the value of 0. We include firm-specific variables *firms_{i,t}* and macroeconomic indicators *macro_{c,t}*. Particularly, we account for short interest, a key measure of investor positioning, which has been linked to the short squeeze effect (Constable, 2015; Mitchell, 2022). Additionally, we incorporate investor attention, as a proxy for online search trends (Engelberg et al., 2011; Brochado, 2019), institutional ownership, the percentage of the stock float held by institutions (Karpoff and Lou, 2010; Orlando, 2022), firm size, measure a market capitalization (Aggarwal and Wu, 2006; Gerace et al., 2014), relative volume, defined as a stock's trading volume relative to the trading volume of the S&P 500 index (Gallant et al., 2015; Mahajan and Singh, 2008). Lastly, we control for market return, represented by the monthly return of the S&P 500 index (Han et al., 2022; Schultz, 2022). The model is estimated by using a panel regression with fixed effects, including monthly effects θ_t . The results are presented based on the marginal effects of the Rare Event Logit model.

In addition, to ensure our findings are robust, we use standard logistic regression as part of our robustness analysis. This allows us to verify that our key results hold across different model specifications and improves our paper by providing more accurate probability estimates.

3 Results

Previous research (see Han et al., 2022; Mitchell, 2022; Schultz, 2022) has examined the interplay between short squeezes and associated factors such as excessive short-selling volumes, heightened investor attention, and retail investor participation. However, despite their contributions, these studies have not explicitly investigated the determinants of short-squeeze occurrences, they investigated the factors rather as concomitant phenomenon. Building upon these recent findings, our study addresses this gap.

As shown in Table 1, the likelihood of a short squeeze occurrence increases with rising short-interest ratios and growing investor attention, whereas higher institutional investor holdings reduce this probability. These findings are crucial, as this is the first study to examine the potential determinants of short squeeze occurrences systematically. Our results suggest that as short interest grows, the probability of a squeeze also increases, likely due to excessive short positioning. The finding aligns with prior research by Constable (2015) and Mitchell (2022), who indicated that short squeezes are not associated with positive managerial changes but rather with the forced unwinding of excessive short positions. Expanding on this literature, we identify that a one percentage point increase in short interest raises the probability of a short squeeze by 1.1%. Moreover, we confirm that a valuable tool in the squeeze effect identification could be incorporated attention of investors (Table 1). It builds upon recent findings of Brochado (2019), who attributed attention increases to spikes in the trading volume (further justified by a positive correlation in Table A2). Additionally, Diangson and Jung (2021) demonstrated that social media attention tends to increase for declining stocks, which helps explain why the interaction between short interest and attention enhances the predictive power of short interest. Specifically, our results indicate that a one percentage point increase in short interest combined with heightened investor attention (models 3 to 5 in Table 1), leads to a five percentage point increase in the probability of a short squeeze.

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	(1)	(2)	(3)	(4)	(5)
Short interest	0.011*	0.013**	0.052***	0.051***	0.051***
	(0.006)	(0.006)	(0.011)	(0.012)	(0.012)
Attention index			0.037***	0.033***	0.033***
			(0.008)	(0.008)	(0.008)
Institutional investors				-0.057***	-0.058***
				(0.019)	(0.019)
Size				0.004	0.004
				(0.003)	(0.003)
Relative volume				0.510	0.542
				(0.671)	(0.680)
Market return					0.032
					(0.073)
Monthly Dummy	No	Yes	Yes	Yes	Yes
Observations	1,898	1,898	1,898	1,898	1,894
Log Likelihood	-142.5	-128.4	-101.2	-94.7	-95.9
N of Companies	70	70	70	70	70

Tab. 1 Key Drivers of Short Squeeze Occurrences

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors*, log market capitalization (*size*), *relative volume*, and *Market Return*. The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. Robust standard errors are reported in parentheses. ***, ***, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

Then, we find that a one percent increase in holdings of institutional investors leads to an almost six percent decrease in the likelihood of a short squeeze occurrence. Such results suggest that institutional investors do not allow abnormal price jumps. It expands on the findings of Orlando (2022), who found that a higher presence of retail investors leads to a more speculative nature of the market due to their higher emotional fluctuations. Another important insight (Table 1) is that we do not confirm any effect of the market capitalization, and the same is valid for the role of the market. These findings suggest that the capitalization of the company does not play any role in the occurrence of a short squeeze. Moreover, we do not provide any evidence for the dependence of the squeeze effect on the market behavior.

Having established the dominant role of short interest in predicting short squeeze occurrences (see Table 1), it is essential to examine the specific intervals within which changes in short interest provide additional predictive insights. To address this, Table 2 categorizes short interest revaluation into five distinct intervals. Our results indicate that an increase in short interest of 7% to 17% raises the likelihood of a short squeeze by 78%. A more substantial rise, from 17% to 25%, leads to a 210% increase in the probability of a squeeze. Furthermore, any increase beyond 25% further amplifies the likelihood by an additional 10%. Notably, only these three models exhibit statistical significance, reinforcing the hypothesis that extreme short positioning triggers forced unwinding, as suggested by Mitchell (2022). While previous studies have examined short squeezes as a concomitant phenomenon, they have not explicitly analyzed the role of short interest intervals in determining their occurrence.

	(1)	(2)	(3)	(4)	(5)
Short interest	-0.010	0.385	0.786*	2.137**	0.092*
	(7.006)	(0.395)	(0.416)	(0.990)	(0.051)
Attention index	0.001	0.018	0.013	0.102**	0.063**
	(0.011)	(0.012)	(0.015)	(0.049)	(0.028)
Institutional investors	0.045	-0.064	-0.076	-0.134	-0.057
	(0.111)	(0.042)	(0.048)	(0.100)	(0.102)
Size	-0.010	-0.004	0.019^{*}	0.020	0.013
	(0.011)	(0.007)	(0.011)	(0.024)	(0.026)
Relative volume	2.126	3.349*	3.930	25.284**	1.403
	(1.815)	(1.818)	(2.470)	(10.844)	(8.881)
Market return	0.007	-0.367	0.373	-0.641	0.025
	(0.334)	(0.228)	(0.451)	(0.611)	(0.527)
Monthly Dummy	Yes	Yes	Yes	Yes	Yes
Observations	363	578	479	232	242
Log Likelihood	-19.7	-24.7	-37.9	-27.6	-24.9
N of Companies	70	70	70	70	70

Tab. 2	Threshold Effects of Key	/ Determinants on Short Sc	ueeze Probability

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors*, log market capitalization (*size*), *relative volume*, and *Market Return*. The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. Results are presented for five models based on short interest ranges: <1% (Model 1); 1-7% (2); 7-17% (3); 17-25% (4); and > 25% (5). Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

As demonstrated in Tables 1 and 2, short interest plays a pivotal role in determining the occurrence of a short squeeze. However, these analyses do not address the extent to which this information can be leveraged for predictive purposes. Having identified both the primary drivers and the threshold effects that significantly impact the likelihood of a short squeeze, we now turn to the predictive power of these determinants over time (see Table 3). Our findings reveal that short interest influences the probability of a short squeeze up to several months in advance, though the magnitude of this effect varies over time. Specifically, a 1% increase in short interest one month ahead leads to a 3.9% rise in the likelihood of a short squeeze in a given stock. Notably, our analysis incorporates companies with varying market capitalizations, including those that have not previously experienced a short squeeze, reinforcing the robustness of our results. The predictive effect of short interest persists at three and four months ahead, though its impact diminishes over time (see Table 3). These findings highlight the temporal dynamics of short interest as a leading indicator, offering valuable insights for market participants seeking to anticipate short squeeze occurrences.

	(1)	(2)	(3)	(4)	(5)
Short interest	0.051***				
	(0.012)				
Attention index	0.033***	0.030***	0.032***	0.033***	0.035***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Institutional investors	-0.058***	-0.060***	-0.051**	-0.054**	-0.055**
	(0.019)	(0.020)	(0.020)	(0.021)	(0.022)
Size	0.004	0.004	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Relative volume	0.542	0.385	0.483	0.407	0.479
	(0.680)	(0.768)	(0.767)	(0.823)	(0.848)
Market return	0.032	0.076	0.082	0.081	0.089
	(0.073)	(0.084)	(0.086)	(0.088)	(0.092)
Short interest _{t-1}		0.039***			
		(0.012)			
Short interestt-2			0.017		
			(0.011)		
Short interest _{t-3}				0.015^{*}	
				(0.008)	
Short interest _{t-4}					0.014*
					(0.008)
Monthly Dummy	Yes	Yes	Yes	Yes	Yes
Observations	1,894	1,828	1,758	1,688	1,618
Log Likelihood	-95.9	-95.9	-93.6	-92.6	-92.8
N of Companies	70	70	70	70	70

Tab. 3 Temporal Dynamics of Short Interest as a Predictor of Squeeze Events

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors*, log market capitalization (*size*), *relative volume*, and *Market Return*. The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. Each model includes short interest at time *t* (Model 1); *t*-1 (2); *t*-3 (3); *t*-4 (5). Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

Building on our previous findings, we extend the analysis to account for asymmetries in market conditions. Prior research (Han et al., 2022; Schultz, 2022) suggests that short squeezes predominantly occur following downtrends, driven by the unwinding of prior short positions. However, these studies

do not explicitly distinguish the extent to which short squeezes are associated with bullish versus bearish trends, nor do they examine which trend magnitude has the most pronounced impact on the likelihood of a squeeze. To address this gap, Table 4 presents our analysis of short squeeze likelihoods across different market conditions. Specifically, we differentiate between squeezes occurring in an overall bullish or bearish market, as well as those following a 1% or 3% increase or decrease in stock prices. The results confirm that in most models, the three key determinants of short squeezes—short interest, investor attention, and the presence of institutional investors—remain statistically significant. These findings offer deeper insights into the market dynamics underlying short squeezes, providing a more nuanced understanding of their occurrence across varying market conditions.

	(1)	(2)	(3)	(4)	(5)	(6)
Short interest	0.045***	0.045***	0.056**	0.081***	0.111***	0.058
	(0.015)	(0.015)	(0.022)	(0.025)	(0.033)	(0.042)
Attention index	0.031***	0.031***	0.041***	0.050***	0.068***	0.039
	(0.010)	(0.010)	(0.015)	(0.016)	(0.020)	(0.029)
Institutional investors	-0.055**	-0.056**	-0.043	-0.083**	-0.095**	-0.084
	(0.025)	(0.025)	(0.037)	(0.039)	(0.044)	(0.064)
Size	0.003	0.003	0.002	0.007	0.012	0.004
	(0.004)	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)
Relative volume	1.425*	1.428^{*}	1.821	-4.062	-5.655 [*]	0.571
	(0.818)	(0.825)	(1.201)	(2.806)	(3.102)	(1.404)
Market return	0.271	0.267	0.331	-1.216	-1.279	
	(0.271)	(0.273)	(0.431)	(1.021)	(0.986)	
Monthly Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,332	1,320	761	562	493	284
Log Likelihood	-67.5	-67.5	-42.6	-36.2	-30.5	-14.8
N of Companies	70	70	70	70	70	70

Tab. 4 Short Squeeze Dynamics Across Bull and Bear Markets

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors,* log market capitalization (*size*), *relative volume,* and *Market Return.* The dependent variable is the probability of *Short Squeeze,* taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. The results are distinguished between bull-market (Model 1-3) and bear-market (Model 4-6) conditions based on the Market Return. Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

A key observation from our analysis is that the identified factors influence both bearish and bullish market conditions. However, their impact is significantly more pronounced during market downturns,

particularly when the market experiences a decline of more than 3%. These findings confirm the presence of asymmetries, as initially suggested by Schultz (2022). However, unlike Schultz's study, which did not examine the specific determinants and magnitudes of these effects—nor did it consider bullish market conditions—our results provide a more comprehensive perspective. As shown in Table 4, we find that the impact of short interest, investor attention, and institutional holdings is nearly twice as strong during market downturns. Notably, the effect loses statistical significance when the market decline exceeds 3%, suggesting that prolonged market downturns may be more closely linked to systematic crises rather than the forced unwinding of short positions driven by behavioral factors. Such distinction underscores the importance of considering market conditions when analyzing short-squeeze dynamics.

4 Robustness analysis

To further assess the robustness of our findings, we employ alternative model specifications. Table A4 replicates the results from Table 1, substituting the Firth logit model with a standard logit model. As observed, both the direction and magnitude of the estimated effects remain relatively stable, reinforcing the reliability of our key determinants in explaining short squeeze occurrences. These results provide an empirical foundation for identifying the primary factors influencing short squeeze dynamics.

Beyond model stability, we extend our analysis to examine market asymmetries in greater depth. In Table 4, we previously demonstrated how short squeezes are associated with broader market trends. To further test this relationship, we investigate how the likelihood of a short squeeze is influenced by a stock's prior bullish or bearish trend. We categorize trend persistence into three distinct models, each capturing the influence of prior stock trends over different time horizons. Specifically, we examine stocks that have exhibited either an upward or downward trend over the past three, six, and twelve months. The approach enables a comprehensive assessment of how the duration of preceding market movements affects the likelihood of a short squeeze, offering deeper insights into the role of trend persistence in shaping market dynamics. The results (Table 5) provide insights into the role of prior trends. We find that the likelihood of a short squeeze is significantly influenced by all three types of uptrends and by a preceding 3-month downtrend.

	(1)	(2)	(3)	(4)	(5)	(6)
Short interest	0.082***	0.087***	0.069***	0.019*	0.016	0.026
	(0.019)	(0.021)	(0.018)	(0.012)	(0.012)	(0.025)
Attention index	0.054***	0.059***	0.047***	0.003	0.009	0.019
	(0.012)	(0.013)	(0.012)	(0.006)	(0.007)	(0.015)
Institutional investors	-0.061**	-0.082***	-0.100***	-0.131**	-0.084*	-0.001
	(0.029)	(0.032)	(0.031)	(0.058)	(0.048)	(0.033)
Size	0.005	0.007	0.007	0.005	-0.002	-0.006
	(0.004)	(0.005)	(0.005)	(0.007)	(0.005)	(0.006)
Relative volume	-0.260	-1.117	-0.186	2.588**	2.916***	2.296*
	(1.355)	(1.562)	(1.121)	(1.245)	(1.106)	(1.316)
Market return	-0.007	-0.000	0.002	0.023	0.098	0.198
	(0.119)	(0.122)	(0.105)	(0.154)	(0.164)	(0.214)
Monthly Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,092	1,032	1,132	796	862	762
Log Likelihood	-74.7	-70.5	-73.6	-23.7	-26.1	-27.7
N of Companies	70	70	70	70	70	70

Tab. 5 Impact of Upward and Downward Stock Trends on Squeeze Dynamics

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors*, log market capitalization (*size*), *relative volume*, and *Market Return*. The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. The results are distinguished between periods of positive (Model 1-3) and negative (Model 4-6) price returns over 3-month, 6-month, and 12-month horizons. Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

Our analysis of Table 5 reveals that the impact of short interest, investor attention, and institutional holdings is notably stronger when the stock has been in a prior uptrend, although the effect also remains statistically significant in the case of a preceding downtrend. Furthermore, the findings indicate that a previous bearish trend primarily influences short squeezes in the short term, which may suggest the sudden unwinding of excessive short positions, as previously proposed by Han et al. (2022). In contrast, the effects of a stock's individual price trend differ somewhat from those associated with broader market trends. Such distinction may stem from behavioral factors, as suggested Kapounek et al. (2022) proposed for financial markets, given that investor attention also exhibits a significant impact. These findings highlight the importance of incorporating both market-wide and stock-specific dynamics when assessing the likelihood of a short squeeze.

	(1)	(2)	(3)	(4)	(5)
Short interest	0.066	0.017	0.014	0.085**	0.561***
	(0.076)	(0.015)	(0.029)	(0.033)	(0.153)
Attention index	-0.001	0.013	0.001	0.062***	0.018
	(0.011)	(0.009)	(0.012)	(0.024)	(0.030)
Institutional investors	-0.145	-0.080*	-0.008	-0.109*	-0.184*
	(0.122)	(0.047)	(0.066)	(0.058)	(0.095)
Size	0.008	-0.000	-0.002	0.009	0.038**
	(0.014)	(0.006)	(0.012)	(0.008)	(0.019)
Relative volume	3.143	0.325	4.027*	1.043	-7.448
	(2.500)	(2.786)	(2.304)	(1.276)	(7.911)
Market return	0.143				
	(0.419)				
Monthly Dummy	Yes	Yes	Yes	Yes	Yes
Observations	506	483	276	419	210
Log Likelihood	-19.9	-18.2	-12.2	-25.4	-35.5
N of Companies	70	70	70	70	70

 Tab. 6
 Evolution of Key Predictors During Shifting Market Dynamics

Note: The table reports the marginal effects of Rare Event Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors,* log market capitalization (*size*), *relative volume,* and *Market Return.* The dependent variable is the probability of *Short Squeeze,* taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. The results are distinguished across different periods, capturing distinct market conditions, including the COVID-19 market shocks. Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.

Furthermore, we test the results of Table 1 by dividing the data into five separate periods (Table 6). Such distinction provides us with more details into the role of specific factors in time. Interestingly, we confirm the role of the three previously identified factors. However, attention and short interest had an effect on short squeeze occurrence since 2020. It aligns with Anand and Pathak (2022), who analyzed the specific case of Gamestop and found that the attention of retail investors shifted to specific short-selling strategies only in 2020. Building upon the assumptions of previous research, we confirm the robustness of our results and take a step further by delving into the identification of determinants, extent, asymmetries, and lags. Such identification provides a robust framework for portfolio managers.

5 Conclusion

Our study provides empirical evidence on the key determinants of short squeeze occurrences, offering a systematic approach to identifying and predicting these market anomalies. Our findings confirm that short interest and investor attention are the primary drivers of short squeeze likelihood, with short interest exhibiting a strong positive relationship with squeeze occurrences. The results further demonstrate that heightened investor attention, particularly through social media and online forums, exacerbates the likelihood of a squeeze by amplifying speculative trading activity. Conversely, institutional ownership plays a mitigating role, reducing the probability of short squeezes, likely due to institutional investors' stabilizing influence on market prices.

Our research contributes to the growing literature on financial anomalies by establishing a predictive framework for short-squeeze occurrences as the previous research has not investigated the determinants of the phenomenon. Through rare-event logistic regression and backtesting methodologies, we show that incorporating market indicators—such as short interest fluctuations, trading volume, and investor attention—enhances the ability to anticipate short squeezes. Then, we define thresholds of short interest with the highest predictive power, and we further test the leading role of the determinants. We find that the highest predictive role of short interest and attention is one month ahead. However, the leading effect of the determinants stays significant up to six months ahead. Additionally, we identify market asymmetries, where short squeezes are more pronounced during market downturns, further emphasizing the role of behavioral factors in price formation.

These findings have significant implications for investors, regulators, and policymakers. We take a step further from the current knowledge by addressing the concrete impact of specific determinants, their thresholds, predictive power, and asymmetric nature. For market participants, our results provide actionable insights into identifying potential short-squeeze opportunities and managing risk exposure. For regulators, the study highlights the role of speculative retail activity in driving extreme price movements, underscoring the need for oversight mechanisms to ensure market stability.

Future research could expand on these findings by exploring the role of derivatives, options market dynamics, and the impact of algorithmic trading on short squeeze occurrences. Additionally, further investigation into cross-market effects and global short-selling regulations could provide a more comprehensive understanding of short squeezes beyond the U.S. equity market. By integrating financial microstructure theory, behavioral finance, and empirical asset pricing, this study advances our understanding of short squeeze dynamics and offers a robust foundation for future research.

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Appendix

Table. A1 Summary statistics

Variable	Ν	Mean	SD	p25	Median	p75
Short Squeeze	2590	0.01	0.11	0	0	0
Short interest	1898	0.13	0.26	0.01	0.07	0.17
Attention index	2590	2.66	1.45	1.79	3.18	3.74
Institutional investors	2590	0.63	0.28	0.4	0.64	0.84
Size	2590	5.97	1.84	4.72	6.11	7.33
Relative volume	2590	0	0	0	0	0
Market return	2520	0.01	0.05	-0.01	0.02	0.04

Note: The table presents the summary statistics of the main variables, including *short interest, attention index, institutional investors,* log market capitalization (*size*), *relative volume,* and *Market Return.* The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. The table includes the number of observations (*N*), *mean, median,* standard deviation (*SD*), and quartiles (*p25* and *p75*) distribution of the variables. The data is from March 2018 to March 2021.

Table. A2 Correlation matrix

	Short	Short	Attention	Institutional	Sizo	Relative	Market
	Squeeze	interest	index	investors	3120	volume	Return
Short Squeeze	1						
Short interest	0.034	1					
Attention index	0.112	-0.163	1				
Institutional	0.074	0.010	0 110	1			
investors	-0.074	-0.016	0.118	T			
Size	0.018	-0.248	0.434	0.633	1		
Relative volume	0.093	-0.065	0.253	-0.021	0.350	1	
Market return	0.010	0.005	0.014	0.010	0.038	-0.009	1

Tab. A3 Description of variables

Variable	Descriptions
Dependent variable	
	Defined as the occurrence probability of Short Squeeze effect, taking the
Short Squeeze	value of 1 when a Short Squeeze was observed. Otherwise, it takes the
	value of 0.
Control variables	
Short interest	Defined as the ratio of the number of a company's shares that have been
	sold short but not yet covered to the total number of outstanding shares.
	Data sources: Morningstar database
Attention index	Defined as the intensity of the search after entering the name of the stock
	tickers of the companies under study (provides a sentiment indicator with
	values ranging from 0 to 100). Data sources: Google Trends
Institutional investors	Defined as the percentage of float stocks that are held by large
	institutions. Data sources: Morningstar database
Size	Defined as the natural logarithm of the market value of equity. Data
	sources: Morningstar database
Relative volume	Defined as the ratio of stock's trading volume relative to the trading
	volume of the S&P 500 Index. Data sources: Morningstar database
Market return	Defined as the percentage change in the S&P 500 Index price over a
	monthly period. Data sources: Morningstar database

	(1)	(2)	(3)	(4)	(5)
Short interest	0.009	0.013	0.060***	0.059***	0.058***
	(0.006)	(0.009)	(0.015)	(0.016)	(0.016)
Attention index			0.045***	0.040***	0.040***
			(0.010)	(0.010)	(0.010)
Institutional investors				-0.069***	-0.069***
				(0.022)	(0.022)
Size				0.005	0.005
				(0.003)	(0.003)
Relative volume				0.488	0.523
				(0.859)	(0.861)
Market return					0.048
					(0.086)
Monthly Dummy	No	Yes	Yes	Yes	Yes
Observations	1,898	1,331	1,331	1,331	1,327
N of Companies	70	70	70	70	70

Tab. A4 Validation of Key Determinants Using Standard Logit Specification

Note: The table reports the marginal effects of Logistic regressions by analyzing the determinants of *short interest, attention index, institutional investors*, log market capitalization (*size*), *relative volume*, and *Market Return*. The dependent variable is the probability of *Short Squeeze*, taking the value of 1 when a Short Squeeze effect was observed. Otherwise, it takes the value of 0. Robust standard errors are reported in parentheses. ***, ***, and * denote statistical significance at 1%, 5% and 10%, respectively. The data is from March 2018 to March 2021.