In the Money? Low-Leverage Option Betting

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ABSTRACT

Retail options trading has grown significantly in recent years, yet little is known about how unsophisticated investors trade contracts across differing levels of leverage. Using a comprehensive equity options database, I show that a substantial share of the total dollar investment by individual customers trading fewer than 100 contracts per day is concentrated in low-leverage In-the-Money (ITM) options, followed by high-leverage Out-of-the-Money (OTM) options. This pattern challenges the conventional view that retail traders primarily seek lottery-like OTM contracts. Instead, ITM activity is concentrated in short-term call options on high-priced stocks, which investors perceive as as a cost-effective way to gain exposure to expensive stocks and offering smaller but more consistent payoffs. Such behavior aligns with investors' cash constraints and risk tolerance, even though it results in generalized losses.

Keywords: options, retail investors, habitat preferences, social networks.

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1. Introduction

Retail participation in the options market has expanded substantially, now accounting for a significant share of overall equity options trading. Existing research has documented the growing presence and influence of unsophisticated investors in these markets , showing that they often incur considerable losses when trading options (Bryzgalova, Pavlova, and Sikorskaya, 2022, Bogousslavsky and Muravyev, 2024, de Silva, Smith, and So, 2023).

However, much less is known about how these uninformed investors behave in the options market, where leverage and complexity are defining characteristics. In contrast to the equity market, where prior research has provided valuable insights into retail investors' decision-making processes (Barber and Odean, 2000, 2008, Barber, Lin, and Odean, 2023), the options market introduces additional features, such as leverage and time to maturity, that play a key role in shaping retail investors' trading patterns and performance. Understanding how these dimensions, together with the characteristics of the underlying asset, interact to influence retail participation is crucial for interpreting investors' motivations, assessing their trading outcomes, and evaluating the broader implications for financial stability.

In this paper, I analyze how leverage, and other contract and stock characteristics influence the trading dollar volume of individual investors in the equity options market. The analysis draws on one of the most comprehensive open–close datasets available, covering approximately 70 percent of total equity option activity from 2014 to 2022. Evaluating option trading volume in dollar terms offers a more accurate perspective on how retail investors allocate their financial resources. Given that most of these investors operate with limited capital, measuring activity in dollar value provides a clearer understanding of the economic significance of these unsophisticated investors in the options market. My main empirical finding, is that in dollar terms, retail investors concentrate a large share of their activity in low leverage options. This pattern challenges not only the conventional view that retail investors are primarily attracted to options for their lottery like characteristics (Boyer and

Vorkink, 2014), typically associated with high leverage, but also the classical literature on investors' motivations for trading options. According to Black (1975), investors are drawn to equity options mainly for their leverage potential. High leverage contracts not only offer higher expected returns (Coval and Shumway, 2001) but also provide hedging opportunities (Goldstein, Li, and Yang, 2014)

I find that In The Money (ITM) options, which provide the lowest degree of leverage, represent an economically significant segment of the options traded by individual customers. Among small-size trades involving fewer than 100 contracts trated by individual customers (small customers), ITM options account for approximately 40 percent of the total dollar volume in equity options. By comparison, Out of The Money (OTM) contracts, which offer the highest leverage, account for about 35 percent, while At The Money (ATM) options represent the remaining 25 percent. In terms of maturity, the dollar volume of ITM options traded by small customers is concentrated in short-term contracts, whereas OTM options are more common in longer-term maturities. To capture this relationship, I compute the daily difference between the dollar trading volume of ITM and OTM options for each stock and trading day. Higher values of this measure are strongly associated with short-term contracts, those with maturities of fewer than seven days, while negative values correspond to longer maturities exceeding thirty days. Consistent with prior evidence that retail traders favor short-term options, this paper extends the literature by analyzing how maturity choices vary across contracts with different levels of leverage

Distinguishing between call and put options is essential, as retail investors predominantly trade on the buy side of calls, and the documented patterns are therefore significantly stronger for call options than for puts.. Importantly, these results are based exclusively on new option positions, identified through a key feature of the open–close database that classifies each trade as an opening buy, opening sell, closing buy, or closing sell, allowing for precise identification of net trading activity.

A potential explanation for this behavior is that retail investors concentrate their trading activity in specific segments of the market that align with their cash constraints and risk tolerance, consistent with the notion of a preferred habitat. Under this interpretation, investors with limited capital gravitate toward short-term ITM call options as a cost-effective means of gaining exposure to high-priced, lower-volatility stocks while minimizing both the upfront investment relative to purchasing the underlying shares and the perceived downside risk compared to OTM options. Consistent with this view, I find that ITM short-term call options are more concentrated in stocks with higher prices and lower return volatility. This evidence suggests that retail investors use ITM options as an affordable substitute for direct stock ownership, particularly in large, stable firms such as Apple, Nvidia, and Tesla, allowing them to participate in these markets without committing the full amount of capital required to purchase the underlying shares. In contrast, OTM call options dominate trading in smaller, speculative, and highly volatile stocks, including well-known meme stocks such as GameStop (GME) and AMC. Taken together, these findings indicate that retail investors occupy distinct segments of the options market: they rely on ITM options to gain exposure to expensive, stable stocks that would otherwise be financially inaccessible, while using OTM options as vehicles for speculative trading in riskier and more volatile stocks.

Further evidence of this trading segmentation emerges from a regression discontinuity analysis, which reveals a distinct threshold around a stock price of approximately $550. Above this threshold, individual investors exhibit a pronounced preference for ITM over OTM options. This finding is consistent with the idea that affordability constraints shape retail investors' option demand, as survey evidence indicates that 33 percent of male investors and 38 percent of female investors hold account balances below $2,000 (Lush, Fontes, Zhu, Valdes, and Mottola, 2021).

Based on the Vayanos and Vila (2021) model, preferred habitat investors that overallocate their portfolios on a certain segment of the market, are willing to forego financial gains and are less price sensitive than other investors. If retail investors behave as preferred habitat investors by concentrating their trading in low leverage options, they should exhibit systematic losses when trading them. This is precisely what I find. Despite their perceived appeal, ITM options generate negative performance in dollar terms. On average, retail investors incur significant daily losses in dollar terms when trading ITM options, with the poorest performance observed in short-maturity contracts, those with less than one week to expiration, and in options of high-priced underlying stocks. Compared with OTM and ATM options, the losses on ITM contracts are substantially larger.

To ensure that my results capture the behavior of retail investors rather than professional traders, I conduct a series of additional analyses to verify that the concentration of activity in short-term ITM call options is primarily driven by individual investors.

First, I find that professional customers and firms do not exhibit the same trading behavior as individual investors. In dollar terms, OTM contracts represent the largest and most economically significant segment of their option trading activity, accounting for 42 percent of total dollar volume among professionals and 44 percent among firms. These are followed by ATM options, which comprise 38 percent and 33 percent of total dollar volume for professionals and firms, respectively, while ITM options account for only 21 percent and 23 percent. Moreover, trading patterns differ markedly across investor types when considering contract maturity. Unlike retail investors, whose dollar volume is highly concentrated in short-term ITM options with less than one week to expiration, professional investors and firms exhibit greater activity in OTM options with long-term maturities. Finally, while small customers experience negative dollar performance when trading ITM short-term options, professionals and firms display the opposite pattern, earning positive returns in these contracts.

Second, as noted by Bogousslavsky and Muravyev (2024), the "customer" category in the open–close option database may also include other participants besides retail traders, such as professional hedge funds. To address this limitation and establish a more precise link between option trading and retail investor activity, I incorporate data from StockTwits, one of the most widely used social media platforms among retail investors. I find there is a positive and significant correlation between retail attention on social media and the dollar volume of equity options. Stocks with abnormally high retail attention on StockTwits show an increase in the dollar volume of options traded by small customers, specifically in open contracts. For these high-attention stocks, the dollar volume of call options exceeds that of put options. Furthermore, the dollar volume increase is more pronounced for ITM options than for OTM options in short-term contracts with maturities of less than seven days. For longer maturities, this difference declines and becomes significantly negative. These results hold even after controlling for past stock returns, volatility, and abnormal news volume from traditional media sources.

Lastly, I examine retail investors' discussions on StockTwits related to option trading. The number of option-related posts has increased markedly in parallel with the rise in retail trading activity, reflecting the growing attention retail investors give to these markets. More interestingly, the conversations revolve around the choice between trading ITM and OTM options suggests that their preference for ITM options comes from the perception that they are safer and more likely to give positive returns. Several retail traders describe ITM options as a way to make smaller but more consistent gains, in contrast to OTM options, which they often associate with risky "lottery-like" bets. These discussions reveal a broader perception among retail investors that ITM options provide a more attainable and less volatile path to trading success, particularly when the underlying stocks are high priced and stable, even though this belief does not necessarily hold in practice.

Together, these findings reveal that retail investors' behavior in the options market is shaped by both cash constraints and distinctive risk preferences, leading them to concentrate their trading in low-leverage contracts. This pattern is consistent with the notion of preferred habitat investors (Vayanos and Vila, 2021), who allocate disproportionately to a specific market segment despite foregone financial gains. Retail traders appear to perceive ITM options as a safer and more affordable way to gain exposure to high-priced equities while chossing OTM contracts for more volatile and risker bets. By documenting this preference, my paper identifies a previously overlooked yet economically significant segment of the options market, providing new insight into the motives and constraints that shape retail investors' trading behavior.

1.1. Related literature and contributions

My research contributes to the existing literature by advancing the understanding of the motivations that drive investors to trade options and the distinctive characteristics that make these instruments appealing. Sanghvi, Sharma, and Chandani (2024) provide a comprehensive review of studies examining individual investors' motives for trading equity derivatives, broadly classifying them into three categories: hedging and speculation (Lakonishok, Lee, Pearson, and Poteshman, 2007, Goldstein, Li, and Yang, 2014), returns versus risk (Bernard, Boyle, and Gornall, 2011), and gambling (Bauer, Cosemans, and Eichholtz, 2009). In particular, it relates to the growing literature on retail options trading, where the conventional view holds that retail investors participate in these markets mainly for speculative or gambling purposes, often through high leverage contracts. For example, Boyer and Vorkink (2014) argue that the lottery like characteristics of options, like their leverage and nonlinear payoff structures, appeal to investors with preferences for positive skewness. Similarly, Filippou, Garcia-Ares, and Zapatero (2018) suggests that OTM options serve as the primary securities with lottery characteristics for skewness-seeking investors, like retail investors.

My paper introduces a new dimension to this discussion by showing that investor motives extend beyond the pursuit of high leverage or lottery like payoffs. ITM options attract retail investors not because of extreme return potential, but because they provide a higher probability of payoff and a cost effective way to gain exposure to high priced, low volatility stocks. This perspective broadens the existing narrative on retail participation in derivative markets, suggesting that many retail traders behave as preferred habitat investors who allocate their limited capital toward contracts that align with their financial constraints and perceived risk tolerance. The paper also contributes to the recent and expanding literature on the growing role of retail investors in the options market, which highlights their limited sophistication and poor performance in these complex contracts, including Bryzgalova, Pavlova, and Sikorskaya (2022), Bogousslavsky and Muravyev (2024), and de Silva, Smith, and So (2023).

Furthermore, it contributes to the growing literature on retail investors' participation in social media and the connection between the information they share and their trading activity in financial markets. Cookson, Lu, Mullins, and Niessner (2024) provides a detailed review of the role that social media plays in shaping retail investor behavior. Related studies, such as Cookson and Niessner (2020), Cookson, Fos, and Niessner (2021), and Cookson, Lu, Mullins, and Niessner (2022), examine StockTwits and its influence on retail trading in equity markets. This paper extends this line of research by incorporating StockTwits data into the analysis of retail activity in the options market, offering new evidence on how social media attention correlates with trading strategies in equity options.

Lastly, my paper relates to the literature on preferred habitat investors (Vayanos and Vila, 2021), which argues that investors concentrate their portfolios in specific market segments that align with their financial constraints and risk preferences. While prior studies document such behavior in bond markets (Giese, Joyce, Meaning, and Worlidge, 2024, Boermans, 2023), and equities (Dorn and Huberman, 2010, Laarits and Sammon, 2025), my findings extend this framework to retail option traders. I show that retail investors display habitat like behavior by concentrating their trading in short-term, low leverage ITM option contracts that reflect their cash constraints and perceptions of risk, even when this behavior leads to foregone financial gains.

2. Data and Main Variables

2.1. Option data and variables

To construct the primary dataset, I aggregated daily Open-Close records of option trading volume from January 2014 to December 2022 across the following eight exchanges:

1. CBOE: Open-Close Chicago Board Options Exchange C1 and C2 exchanges: CBOE, CBOE-C2, CBOE-BZX, CBOE-EDGX.

2. NOTO: Nasdaq Options Trade Outline.

3. PHOTO: PHLX Options Trade Outline.

4. ISE: International Securities Exchange Open/Close Trade Profile.

5. GEMX: GEMX Open/Close Trade Profile.

To my knowledge, this dataset is one of the most comprehensive and granular Open-Close datasets used in academic research on options markets, as it covers approximately 70% of the total options trading volume as reported by OptionMetrics. Figure 1 provides a detailed breakdown of data coverage across the exchanges, as each has varying inclusion periods in the analysis. The dataset covers all the option contracts of stocks with share code 10 or 11 from the Center for Research in Security Prices (CRSP) at the contract-day level.

Aggregating data from all exchanges for each option contract results in a big and comprehensive database. Overall, the database covers 3,000 unique stocks, 3 million option contracts, and up to 200 million observations, on average per year, as detailed in Table 1. Each option contract recorded on OptionMetrics of all stocks considered in this analysis is merged with its corresponding open-close volume data across all exchanges. The variables of Optionmetrics include the daily option price, forward price, implied volatility, and delta. This linkage is established by matching key parameters, including the ticker symbol, root, trade date, expiration date, option type (put or call), strike price, and settlement time (AM or PM). This matching process relies on the SecId-PERMNO crosswalk provided by WRDS.

Each option contract is identified as a put or a call, by its strike price, by time of execution, and by time of expiration. Furthermore, each option is accompanied by its directional trading data, encompassing both its trading volume and the number of trades recorded at the close of each trading day, divided into four specific categories: opening buys, opening sells, closing buys, and closing sells. Opening buys refer to new trades that initiate a long position on the underlying, and closing buys to trades that close an existing short position. Conversely, opening sells refer to new trades that initiate a short position on the underlying, and closing sells to trades that close an existing long position.

The option volume is also categorized according to which investor classes initiate the trades: customers, professional customers, market makers, proprietary trading firms, and broker-dealers. These four types of investors collectively constitute the trading data for all non-market makers. Precisely, a "Professional Customer" is defined as an individual or entity that (i) is not a broker or dealer in securities, and (ii) places more than 390 orders in listed options per day on average during a calendar month for its own beneficial accounts. On the other hand, "Customers" also engage in trading on their own accounts, but their trading activity does not reach the threshold required to qualify them as "Professional Customers". Furthermore, the trading activity of "Customers" is broken down into trade size buckets: less than 100 contracts, 100-199 contracts, and greater than 199 contracts. This granular breakdown of trade size is an important feature for my analysis, as my primary variable of interest will be "Customers" trades with the smallest size, i.e., less than 100 contracts, referred to as "small customers" throughout the paper.

I calculate the Trade Volume and Dollar Volume for every option contract by aggregating all opening buys, opening sells, closing buys, and closing sells. Unlike Trade Volume, which measures the number of contracts traded, Dollar Volume reflects the value of investor capital committed to the options market, denominated in US dollars. While Trade Volume is the simplest and most commonly used metric in the literature, Dollar Volume, which indirectly accounts for leverage using the price of the option contract, provides a more comprehensive representation of the wealth invested in the options market. Trade Volume $Volume(j,t)$ and Dollar Volume $DollarVolume(i,j,t)$ of option contract i, stock j, at day t, are calculated as follows:

$$Volume_{i,j,t} = OpenBuy_{i,j,t} + CloseBuy_{i,j,t} + OpenSell_{i,j,t} + CloseSell_{i,j,t}$$

$$DollarVolume_{i,j,t} = O_{i,j,t} \cdot Volume_{i,j,t} \tag{1}$$

Where $OpenBuy, CloseBuy, OpenSell, CloseSell$ represents the trading volume in number of contracts of option contract i, stock j, at day t. And $O_{i,j,t}$ is the price of the option contract i, of stock j, at day t.

To account for the direction of each option trade, it is important to note that $OpenBuy$ and $CloseBuy$ account for buy volume, while $OpenSell$ and $CloseSell$ account for sell volume. Therefore to compute the buy-minus-sell volume, I calculate the Order Imbalance $OIB(i,j,t)$ of option contract i, stock j, at day t, as follows:

$$OIB_{i,j,t} = OpenBuy_{i,j,t} + CloseBuy_{i,j,t} - OpenSell_{i,j,t} - CloseSell_{i,j,t} \tag{2}$$

In dollar terms the Dollar Net Order Imbalance is calculated:

$$DollarNOI_{i,j,t} = O_{i,j,t} \cdot OIB_{i,j,t} \tag{3}$$

Dollar Net Order Imbalance measures the directional volume of options contracts traded on a given day, in dollar terms. This paper examines the performance of every option contract using the previously defined Dollar Net Order Imbalance, $DollarNOI(i,j,t)$. Performance is calculated both in dollar terms and as a percentage return. Specifically, the dollar performance of each option contract is calculated as follows:

$$\$PerfNOI_{i,j,t-1:t} = DollarNOI_{i,j,t} \times 100 \times \left(\frac{O_{i,j,t} - O_{i,j,t-1}}{O_{i,j,t-1}} \right) \tag{4}$$

Where $O_{i,j,t}$ and $O_{i,j,t-1}$ are the prices of option contract i, of stock j on day t and $t-1$, respectively.

To account for the dollar-denominated nature of the previous measure, I introduce an additional performance metric that compares the return of an option contract to the return of its underlying stock. This metric calculates the abnormal return of an option contract over a specified time interval as follows:

$$AbnRet_{i,j,t-1:t} = Direction_{OIB_{i,j,t}} \times \left(\frac{O_{i,j,t} - O_{i,j,t-1}}{O_{i,j,t-1}} - \frac{S_{i,j,t} - S_{i,j,t-1}}{S_{i,j,t-1}} \right) \tag{5}$$

Where $Direction_{OIB_{i,j,t}}$ is the trade direction of wheter the option contract is positive (buy) or negative (sell) determine by the order imbalbance $OIB_{i,j,t}$. And $S_{i,j,t}$ is the price of the underlying stock j of option contract i, at day t.

While I calculate all variables for each option contract i, for my main analysis I aggregate these variables at the stock-day level. This aggregation considers different payoff types (Call or Put), time to maturity (τ), types of moneyness (F/K), and type of investor (Small Customers, Professionals, and Firms). Regarding the maturity of the options, I consider four different buckets: less than 7 days, 8 to 30 days, 30 to 90 days, and over 91 days. Moneyness is classified into three types: In-the-Money (ITM), Out-of-the-Money (OTM), and At-the-Money (ATM). To determine the level of moneyness of an option, I calculate the ratio (F/K) between the Forward Price of the Stock (F) and the Strike Price of the Option Contract (K). For call options, if $F/K < 0.975$, the contract is considered to be OTM, while if $F/K > 1.025$, it is ITM. Conversely, for put options, if $F/K < 0.975$, the contract is ITM, and if $F/K > 1.025$, it is OTM.

2.2. Social Media, News and Stock data

For my analysis, I obtained data from one of the most popular social media platforms among retail investors: Stocktwits, from January 2014 to December 2022. This data was accessed via RapidAPI. Similar to Twitter, users can post on Stocktwtis "tweets" or messages on the platform about stocks adding a $ Cashtag symbol followed by the stock ticker symbol. I retrieve all posts whose $ Cashtag symbolx are tickers of stocks with share code 10 or 11 from CRSP. I aggregate the number of posts related to each ticker on a daily basis. Figure 7 in Panel A shows the aggregate monthly number of posts that include at least one ticker from my sample.

Additionally, I consider firm-level news data from RavenPack for the same stock sample, aggregating the number of news articles by stock on a daily basis. From CRSP, I also obtained daily stock returns and market capitalization for every firm. Finally, I merged the StockTwits data, RavenPack news, and stock data with the options data using ticker symbols and dates.

3. Economic significance of low leverage options

Since ITM options have received limited attention in the literature, this section presents several stylized facts about these derivatives. I begin by highlighting their economic significance among small customers. While OTM options dominate in terms of trade volume for both call and put options, in dollar terms ITM options account for a substantial share of dollar trading volume, suggesting that a significant portion of overall market wealth is allocated to these instruments. Analyzing retail trading in dollar terms, rather than merely by the number of trades, is crucial for understanding where retail investors actually allocate their capital and the magnitude of their financial exposure. Evaluating trading volume in dollar terms offers a more accurate perspective on how investors allocate their financial resources. Given that most retail investors trade with limited capital, measuring activity in dollar value provides a clearer understanding of the economic significance of these unsophisticated investors in the options market. While trade counts capture participation, dollar volume reflects the true economic weight and potential risk concentration of retail activity.

Figure 2 shows the average trade volume (number of trades) in Panel A, and the average dollar volume in Panel B for level of moneyness for options traded by small customers. Moneyness is defined as the ratio F/K rounded to two decimals, where F is the forward price of the underlying stock, and K is the option's strike price.

It is evident that OTM options dominate in terms of trade volume for both call and put options. However, this trend reverses when dollar volume is considered. On an average day, for an average stock, ITM options surpass other types, particularly OTM options, in dollar volume, reflecting a greater level of investment in ITM options. A similar, though less pronounced, trend is observed for options traded by professionals and firms, as shown in Figure AA1.

I further aggregate the dollar volume, this time by type of moneyness instead, and report the summary statistics on Table 2 for call (Panel A) and put (Panel B) options by investor. For call options, if $F/K < 0.975$, the contract is considered to be OTM, while if $F/K > 1.025$, it is ITM. Conversely, for put options, if $F/K < 0.975$, the contract is ITM, and if $F/K > 1.025$, it is OTM. For an average day and for the average stock, the dollar volume of ITM options traded by small customers surpasses that of OTM and ATM options for both call and put options. Specifically, in Panel A for call options, aggregating the dollar volume across the entire sample period shows that ITM options account for 42% of the total, compared to 29% for OTM options and 29% for ATM options. This trend is reversed for professionals and firms, where the average dollar volume of ITM call options is lower than that of OTM and ATM call options, representing only 21% and 23% of the total dollar volume, respectively. A similar trend is observed for put options in Panel B, though the average dollar volume of ITM call options is significantly higher than that of ITM put options.

Overall, these results highlight the strong preference of small customers for investing in ITM options, particularly for call options, though to a lesser extent for puts. ITM options account for a significant portion of the total dollar volume traded by small customers. In contrast, professionals and firms tend to favor OTM and ATM options, revealing distinct trading patterns between different type of investors.

The dollar volume of ITM options traded by small customers has grown significantly in recent years, alongside similar increases in OTM and ATM options. Figure 3 illustrates the daily average dollar volume at the stock-daily level for ITM, OTM, and ATM options. For call options (Panel A), the dollar volume shows notable spikes in 2018 and March 2024, particularly for ITM and OTM options. This growth coincides with the introduction of commission-free options trading by Robinhood in January 2018, which made options trading more accessible to individual investors, and the surge in retail participation during the COVID-19 pandemic in March 2021. In contrast, this pattern is less pronounced for put options, as shown in Panel B.

3.1. Short-term Trading

Another key characteristic of options, in addition to leverage, is maturity. Understanding how retail investors allocate their trading activity across maturities provides valuable insight into their trading motives and risk preferences. To examine this dimension, I analyze the distribution of dollar trading volume in equity call options across different maturities. Specifically, I compute the stock–day dollar volume for call options and group the contracts into five maturity categories: 0–7 days, 7–30 days, 30–90 days, and more than 90 days. This analysis helps capture whether retail investors exhibit a preference for short-term, highly speculative positions or longer-term exposures that imply different economic motives.

The distribution is visualized using a box plot in Figure 4. In the plot, the arms represent the 10th and 90th percentiles, while the upper and lower edges of the box correspond to the 75th and 25th percentiles, respectively. Panel A reveals that for ITM call options, the box for short maturities (less than 7 days) has significantly expanded in recent years, surpassing that of long-maturity call options (over 90 days), which previously dominated. In contrast, for OTM call options, the box representing long maturities remains the largest across all categories, for all percentiles. The corresponding results for put options are presented in Figure AA2 in the appendix.

To further examine this relationship, I calculate the daily difference between the dollar trading volume of ITM and OTM options for each stock. Using this measure, I find that higher values are strongly associated with options that have maturities of less than seven days, while negative values correspond to contracts with longer maturities of more than thirty days. This pattern indicates that short-term trading among retail investors is, on average, concentrated in low-leverage ITM options, whereas longer-term trading activity tends to focus on high-leverage OTM contracts.

Table 3 presents regression results that quantify these differences across investor types. Consistent with the visual evidence, the coefficient on the short-maturity indicator ($\mathbb{1}^{<7}$) is positive and statistically significant across all investor categories for call options, with the largest magnitude observed among small customers. This finding confirms that short-term activity in call options is disproportionately driven by retail investors' preference for ITM contracts. In contrast, coefficients for longer maturities ($\mathbb{1}^{30-90}$ and beyond) are negative and significant, indicating that positions with extended maturities are more concentrated in OTM options, particularly among professional and firm investors.

For put options, reported in the right panel of the table, the relationship is weaker and less consistent. Retail investors still exhibit a modest preference for short-term ITM contracts, but the coefficients are smaller in magnitude. Overall, the evidence highlights a clear maturity-based segmentation in the options market: short-term ITM trading is largely a retail phenomenon, while longer-term OTM positions are dominated by more sophisticated participants.

Distinguishing between call and put options is essential, as retail investors predominantly trade in call options, and the empirical patterns documented here are considerably stronger for calls than for puts. Because the most pronounced increase in activity is observed for call options, the main analysis focuses on this category.

4. Trading motives and performance of ITM options

4.1. Motives

A potential explanation for the observed trading patterns is that retail investors concentrate their activity in specific segments of the options market that best align with their financial constraints and tolerance for risk, consistent with the notion of a preferred habitat. Rather than participating uniformly across the entire range of contracts, retail investors appear to allocate their limited capital toward short-term ITM call options as a cost-effective way to gain exposure to high-priced, lower-volatility stocks while maintaining a perception of limited downside risk.

ITM options provide immediate intrinsic value and a higher probability of finishing in the money compared to OTM contracts, which may create the impression of a safer bet despite offering lower leverage. By focusing on low-leverage ITM options with short maturities, these unsophisticated investors effectively engage in speculative strategies that resemble short-term stock ownership, but at a fraction of the cost required to purchase the underlying shares. This preferred-habitat interpretation helps explain why retail investors play a disproportionately large role in the ITM segment of the options market and why their trading patterns differ fundamentally from those of professional and institutional participants.

This pattern suggests that the demand for ITM options is particularly pronounced among high-priced, lower-volatility stocks, where the cost of purchasing the underlying shares is substantial. To examine this relationship, I analyze how the difference between ITM and OTM dollar trading volume varies with characteristics of the underlying stocks. Specifically, for each ticker, I compute the daily average difference between the dollar volume of ITM and

OTM options, providing a measure of the relative intensity of ITM trading.

Table 4 reports the 25 underlying stocks with the highest daily average ITM–OTM dollar-volume difference and the 15 stocks with the lowest. Panel A reveals that for call options, the stocks in which ITM contracts are most actively traded relative to OTM are predominantly large, high-priced technology companies. This finding is consistent with the idea that retail investors use ITM options as a cost-effective means to gain exposure to expensive stocks such as Apple, Nvidia, or Tesla without committing the full capital required to purchase the underlying shares. In contrast, the bottom 15 stocks, where OTM trading dominates, tend to be small-cap, high-volatility investments, including well-known "meme" stocks such as GameStop (GME) and AMC.

Further evidence of this price-based segmentation in retail trading behavior emerges from a *regression discontinuity design* (RDD) that examines how investors' relative demand for ITM versus OTM options varies with the price level of the underlying stock. Specifically, I calculate for each stock j on each day t the average ITM–OTM dollar-volume difference, normalized by total trading activity, to construct the following ratio:

$$\Delta(ITM - OTM)_{j,t} = \frac{V_{j,t}^{\text{ITM}} - V_{j,t}^{\text{OTM}}}{V_{j,t}^{\text{ITM}} + V_{j,t}^{\text{OTM}}},$$

where $V_{j,t}^{\text{ITM}}$ and $V_{j,t}^{\text{OTM}}$ represent the dollar trading volumes of ITM and OTM options, respectively. This measure captures the relative intensity of ITM versus OTM trading, ranging from -1 (entirely OTM) to $+1$ (entirely ITM). I then use the logarithm of the stock price, $\log(P_{j,t})$, as the running variable in the RDD to identify potential nonlinear shifts in trading behavior.

Figure 5 Panel A displays the fitted values and observed data from the RDD analysis of Call options traded by small customers. The vertical dashed line marks the estimated cutoff around a log stock price of 6.3 (approximately \$550), determined by selecting the optimal bandwidth that minimizes the mean squared error (Figure 5 Panel B) . The figure reveals a distinct discontinuity in the relative trading intensity of ITM versus OTM Call options, measured by $\Delta(ITM - OTM)_{j,t}$. Stocks priced above the cutoff exhibit a higher relative demand for ITM Call options, while this preference declines sharply for stocks below the threshold. This pattern suggests that affordability constraints play a key role in shaping retail investors' option demand.

Importantly, this discontinuity is not observed among professional customers or firms. As shown in Figure 6, Panels A and B, respectively, their trading activity exhibits no significant break around the same cutoff, indicating that these more sophisticated participants are not subject to the same capital constraints. Furthermore, when I repeat the RDD analysis for put options across all investor categories, no comparable pattern emerges (see Figure AA3 in the Appendix). This reinforces the interpretation that the discontinuity in ITM trading behavior is unique to retail investors' call option activity and likely reflects their limited capital and speculative motives. The results of all the regresions considered are depicted in Table 11 in the Appendix.

4.2. Performance

In line with the preferred habitat explanation, the model of Vayanos and Vila (2021) suggests that preferred habitat investors allocate a disproportionate share of their portfolios to a specific segment of the market, are willing to forego financial gains, and exhibit lower price sensitivity relative to other investors. If retail investors behave as preferred habitat investors by concentrating their trading activity in low-leverage options, such as ITM contracts, they should experience systematic losses when trading these derivatives.

To test this prediction, I compute the daily performance of each option contract using its net order imbalance and transaction price, as described in Section 2. This calculation incorporates all opening buys and sells, as well as closing buys and sells, to capture the net dollar value traded by individual investors on a given day. By linking these flows to subsequent changes in option prices, I estimate the realized gains or losses associated with retail trading across contracts with different levels of moneyness. Specifically, I estimate the following regression model:

$$\$PerfNOI_{i,j,t-1:t} = \beta_1 \mathbb{1}^{\text{ITM}}_{i,j,t} + \beta_2 \mathbb{1}^{\text{OTM}}_{i,j,t} + \beta_3 \mathbb{1}^{\text{ATM}}_{i,j,t} + \alpha_j + \alpha_t + \varepsilon_{j,t}$$

where $\$PerfNOI_{i,j,t-1:t}$ denotes the daily dollar performance of option i on stock j between days $t-1$ and t, and $\mathbb{1}^{\text{ITM}}_{i,j,t}$, $\mathbb{1}^{\text{OTM}}_{i,j,t}$, and $\mathbb{1}^{\text{ATM}}_{i,j,t}$ are indicator variables for the option's moneyness category. The specification includes both stock fixed effects (α_j) and time fixed effects (α_t) to control for unobserved heterogeneity across securities and common time shocks. Table 5 reports the results of the regression examining the daily dollar performance of options traded by small customers across different maturities and levels of moneyness. The coefficients show a consistent pattern of underperformance in ITM options, particularly in short-term contracts. For call options, the returns associated with ITM positions are significantly negative for maturities below 90 days, with the largest losses concentrated in contracts expiring within a week. This indicates that retail investors systematically lose money when trading low-leverage ITM call options over short horizons. In contrast, OTM call options yield positive but smaller coefficients, suggesting occasional gains that are economically limited and not statistically significant across maturities. ATM options exhibit near-zero or insignificant performance.

A similar, though less pronounced, pattern is observed for put options in Panel B. ITM put contracts also show significant losses, especially for maturities below 90 days, while OTM and ATM puts generally perform close to zero. Overall, the evidence supports the interpretation that retail investors behave as preferred-habitat traders, concentrating in low-leverage ITM options despite their persistent underperformance. This behavior suggests that retail traders are willing to forgo expected financial gains in exchange for exposure to options with higher probabilities of exercise, consistent with limited capital and behavioral biases shaping their trading decisions.

To further explore whether the underperformance of retail investors in ITM options is more pronounced among high-priced stocks, I estimate the following specification:

$$\$PerfNOI_{i,j,t-1:t} = \beta_1 \mathbb{1}^{\text{ITM}}_{i,j,t} + \beta_2 \mathbb{1}^{\text{High-Price}}_{j} + \beta_3 \left(\mathbb{1}^{\text{ITM}}_{i,j,t} \times \mathbb{1}^{\text{High-Price}}_{j} \right) + \alpha_j + \alpha_t + \varepsilon_{i,j,t}.$$

In this regression, $\$PerfNOI_{i,j,t-1:t}$ measures the daily dollar performance of option contract i on stock j between days $t-1$ and t. The indicator $\mathbb{1}^{\text{ITM}}_{i,j,t}$ identifies in-the-money options, while $\mathbb{1}^{\text{High-Price}}_{j}$ captures underlying stocks with prices above the estimated cutoff of \$550 (log price ≈ 6.3). The interaction term $\mathbb{1}^{\text{ITM}}_{i,j,t} \times \mathbb{1}^{\text{High-Price}}_{j}$ isolates the differential performance of ITM options on high-priced stocks relative to other contracts. The model includes stock and time fixed effects, α_j and α_t, to control for unobserved heterogeneity across securities and time-specific shocks.

Table 6 presents the regression estimates examining how the dollar performance of small-customer option trading varies across levels of moneyness and stock price. The results reveal that the underperformance of retail investors in ITM options is strongly amplified for high-priced stocks. Panel A shows that ITM contracts generate large and statistically significant losses, particularly for short-term maturities below seven days, with coefficients exceeding \$28,000 on average. The interaction term between ITM options and high-priced stocks is also highly negative and significant across short maturities, indicating that these losses intensify when the underlying stock trades at high prices. This pattern supports the interpretation that retail investors face affordability constraints and suffer larger losses when attempting to gain exposure to expensive stocks through low-leverage ITM options.

In contrast, Panel B shows that OTM options yield positive performance for short maturities, especially among low-priced stocks, with coefficients around \$16,000. However, this profitability disappears or turns negative for higher-priced stocks, as reflected in the large and significant negative coefficients on $\mathbb{1}^{\text{High-Price}}_{j}$ and the interaction term. Finally, Panel C shows that ATM options exhibit smaller magnitudes and mixed signs, consistent with their intermediate leverage profile. Taken together, these results provide strong evidence that retail investors' losses are concentrated in ITM contracts on high-priced stocks, reinforcing the preferred-habitat interpretation: retail traders allocate disproportionate wealth to low-leverage options that mimic stock exposure but entail persistent negative returns.

Finally, to verify that this behavior is specific to retail investors rather than common to all market participants, I reestimate the same regression using the trading activity of professional customers and firms. The results, reported in Table 7, show that these groups do not exhibit the same pattern observed among retail investors.

In summary, the evidence reveals that retail investors display a strong preference for short-term, low-leverage ITM call options, particularly on high-priced, lower-volatility stocks. This behavior is consistent with a preferred habitat interpretation, whereby investors allocate their limited capital to market segments that align with their financial constraints and perceived risk tolerance. The regression discontinuity design (RDD) analysis identifies a clear threshold around a stock price of approximately \$550, beyond which the relative demand for ITM options declines sharply, consistent with affordability constraints limiting retail participation. Performance regressions further show that ITM options not only dominate retail trading activity in dollar terms but also generate persistent and economically significant losses, particularly when the underlying stocks are expensive. Together, these results indicate that retail investors systematically overallocate to low-leverage ITM options as a substitute for direct stock ownership, reinforcing the view that their trading is shaped by financial constraints rather than profit-maximizing motives.

5. Retail attention on social media and options trading

The findings from the previous section highlight that ITM options are predominantly traded by small customers, aligning with recent studies on retail options trading. For instance, Bryzgalova, Pavlova, and Sikorskaya (2022) found that 50% of retail trades are in ultra short-term options, typically expiring in less than a week, and exhibit a strong preference for call options over puts. Similarly, Bogousslavsky and Muravyev (2024) reported a shift in median option maturity for retail traders, dropping from four days in 2020 to just one day by 2022 with trading heavily focused on large technology stocks and riskier assets like GameStop (GME).

Although I focus on customers trading fewer than 100 contracts per transaction, which may suggest retail participation in ITM options, this assumption is not definitive. As Bogousslavsky and Muravyev (2024) noted, the "customer" category in daily signed volume data from open-close options may also include professional hedge funds and other participants, making it difficult to isolate pure retail trading activity.

To overcome this limitation, I examine the relationship between StockTwits activity and option trading to better identify retail investor behavior. While several studies have leveraged StockTwits data to explore retail trading dynamics, this paper is the first to specifically examine its role in retail options trading, providing novel insights into how social media drives retail engagement in this segment of the market. The results reveal a significant and robust correlation between the dollar trading volume of options by small customers and retail investor activity on StockTwits.

For my analysis, I obtain data from StockTwits, one of the most popular social media platforms among retail investors. StockTwits is the largest investor-focused platform and provides broad coverage of publicly traded U.S. stocks. While previous studies have used StockTwits data to analyze retail trading in equity markets (Cookson, Lu, Mullins, and Niessner, 2022, Avila, Martineau, and Mondria, 2024), this paper extends its use to the options market, offering a novel perspective on how social media attention shapes option trading dynamics.

Similar to Twitter, users can post short messages about stocks on StockTwits by including a $ Cashtag symbol followed by the stock ticker. Panel A of Figure 7 displays the aggregate monthly number of posts containing at least one ticker from my sample. To better isolate the link between retail attention and options trading, I refine the analysis by focusing on StockTwits posts containing keywords specifically related to options. Using text analysis, I extract posts containing keywords commonly associated with option trading, such as "derivatives", "calls", "puts", "call spread", "put spread", "itm", "in the money", "in-the-money", "otm", "out of the money", "out-of-the-money", "at the money", and "at-the-money". This filtering ensures that the analysis focuses exclusively on option-related discussions, providing a more precise measure of retail attention in the options market. Panel B of Figure 7 shows the aggregate monthly number of option-related posts, which, although lower, they have also exhibited an upward trend in recent years. They have increased markedly since 2018, consistent with the introduction of commission-free options trading for retail investors by platforms like Robinhood.

5.1. Dollar volume of Options traded by Small Customers and Abnormal Retail Attention

To link StockTwits activity to option trading, this study examines the relationship between social media–driven attention and retail investors' trading behavior in the options market. Using a regression framework that exploits the full time series of observations, I assess the economic significance of this relationship. For each stock, I measure abnormal posting activity as the difference between the average number of StockTwits posts in the previous five days $[t-5, t-1]$ and the average number during a benchmark period $[t-60, t-6]$ for each stock. I compute the abnormal dollar volume of options as the difference between the dollar volume on day t and the average dollar volume over the previous 60 days, for every stock. I then regress the abnormal dollar volume of options, categorized by different types of moneyness, on the abnormal number of StockTwits posts for each underlying stock in my database. The regression model is as follows:

$$AbnVolume(j)^M_t = AbnPost(j,\tau)_{t-1} + AbnNews(j,\tau)_{t-1} + |Ret(j)_{[t-5,t-1]}|$$
$$+ |Ret(j)_{[t-60,t-5]}| + Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t} \quad (6)$$

Where $AbnVolume(j)^M_t$ represents the abnormal change in option dollar volume for stock j at time t compared to its average dollar volume over the period $[t-60, t-6]$, for different types of moneyness $M = ITM, OTM, ATM$, specifically for options traded by small customers. $AbnPost(j,\tau)_{t-1}$ is the abnormal number of StockTwits posts related to stock j, calculated as the difference between the average number of posts over the period $\tau = [t-5, t-1]$ and the average over $[t-60, t-6]$. A similar calculation is applied to $AbnNews(j,\tau)_{t-1}$, which represents the abnormal number of RavenPack news mentions for stock j during the period $\tau = [t-5, t-1]$, relative to the average over $[t-60, t-6]$. $Ret(j)_{[t-5,t-1]}$ and $Ret(j)_{[t-60,t-5]}$ capture the average stock returns of j over the periods $[t-5, t-1]$ and $[t-60, t-5]$, respectively. Lastly, $Vol(j)_{[t-60,t-1]}$ is the standard deviation of stock j returns over the period $[t-60, t-1]$. The model also incorporates stock-specific and time-specific fixed effects, α_j and α_t, respectively.

The results, presented in Table 8, show a significant positive relationship between abnormal dollar volume and the abnormal number of StockTwits posts for both call options (Panel A) and put options (Panel B), across all types of moneyness. As expected for skewness-seeking retail investors there is a strong relatioship for OTM options. But notably, there is also a strong relationship for ITM options. This correlation remains robust even after controlling for variables such as abnormal news volume, past stock returns, and stock volatility. Importantly, these findings suggest that retail investors are not exclusively drawn to options with lottery-like payoffs, such as OTM options. Instead, a segment of retail investors demonstrates a preference for ITM options, rather than solely seeking skewed returns.

To further assess whether the effect differs between ITM and OTM options, I refine the analysis by directly contrasting these two categories. Specifically, I compute the abnormal dollar volume difference between ITM and OTM options, denoted $AbnVolume(j)_t^{ITM-OTM}$. For each stock j and day t, I first calculate the daily difference in dollar volume between ITM and OTM options, and then derive its abnormal component relative to the average difference over the benchmark period $[t-60, t-6]$. This comparison allows for a more precise evaluation of the relative sensitivity of ITM versus OTM trading activity to retail attention shocks.

The results are presented in Table 9, showing the difference in dollar volume between ITM and OTM call options. Column (1) includes all maturities, while columns (2) through (5) break down maturities into less than 7 days, 8 to 30 days, 31 to 90 days, and more than 90 days, respectively. Panel A displays results for call options, and Panel B for put options. Notably for short-term options (less than 7 days) the difference is positive and significant, suggesting that small customers exhibit a stronger preference for ITM call options following periods of abnormal retail attention on StockTwits. In contrast, for longer maturities, $AbnVolume(j)_t^{ITM-OTM}$ declines and eventually turns negative. For put options, the coefficients in column (2) are also positive but smaller in magnitude.

Overall, these findings challenge the prevailing view that retail investors are primarily attracted to options with lottery-like payoffs, such as OTM options. Instead, a significant portion of retail investors demonstrates a clear preference for short-term ITM options, suggesting that their trading behavior is not solely driven by a desire for skewed returns.

To ensure the robustness of these results, I refine the measure of social media attention. Specifically, I adjust the variable $AbnPost(j,\tau)_{t-1}$, which captures all posts related to stock j. While this measure reflects general retail attention, not all posts necessarily refer to option trading. To address this, I use the option-related posts on Stocktwits. I then estimate the following the regression:

$$\begin{aligned} AbnVolume_{j,t}^{ITM-OTM} =& AbnPost(j,\tau)_{t-1} + \mathbb{1}_{j,t-1}^{\text{Option}} + AbnPosts(\tau)_{t-1} \times \mathbb{1}_{j,t-1}^{\text{Option}} + AbnNews(j,\tau)_{t-1} \\ &+ |Ret(j)_{[t-5,t-1]}| + |Ret(j)_{[t-60,t-1]}| + Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t} \end{aligned}$$

where $AbnVolume(j, M)_t$, $AbnPost(j, \tau)_{t-1}$, $AbnNews(j, \tau)_{t-1}$, $|Ret(j)_{[t-5,t-1]}|$, $|Ret(j)_{[t-60,t-1]}|$ and $Vol(j)_{[t-60,t-1]}$ are defined in E quation 6. $\mathbb{1}_j^{\text{Option}}$ is a dummy variable set to one if a stock j has at least 60 posts related to option trading in the 60 preceding days.

The results are presented in Table 10 for short-term option contracts (less than 7 days), which prior research indicates are particularly appealing to retail investors. Columns (1) and (2) report the results for options traded by small customers, for call and put options, respectively. The interaction term between abnormal StockTwits posts and option-related content is positive and statistically significant, with the effect being especially strong for call options. This relationship remains robust after controlling for other explanatory variables, suggesting that social media attention—particularly when posts explicitly reference options—exerts a stronger influence on the trading behavior of small retail investors.

To further explore this dynamic, I replicate the analysis for options traded by professional customers in columns (3) and (4), and for firms in columns (5) and (6). Although the interaction term remains positive for these groups, its magnitude is substantially smaller, underscoring the disproportionate impact of social media activity on retail investors relative to more sophisticated market participants. These results confirm that the surge in ITM option demand is primarily driven by retail traders, distinguishing their trading patterns from those of professional and institutional investors.

Finally, I further examine the information shared by retail investors on StockTwits regarding options. In particular, I analyze conversations that discuss the characteristics of both ITM and OTM contracts, which investors use to guide their trading strategies and to inform their choice between low and high leverage contracts. Figure 8 presents illustrative examples of StockTwits posts that shed light on retail investors' motives for trading ITM options. These posts reveal that many investors perceive ITM options as safer and more consistent instruments than OTM contracts, emphasizing their higher probability of profit, lower risk, and similarity to owning the underlying stock. Several users also note that ITM options enable steady returns and facilitate short-term trading with limited downside exposure.

To further examine this perception, I calculate the daily returns of all call option contracts, average them by underlying stock, and classify the results by moneyness (ITM or OTM) and maturity. Short maturities correspond to options expiring in less than 7 days, while long maturities refer to contracts with more than 90 days to expiration. Figure 9 presents the resulting distributions. Panel A shows that for short-maturity call options, ITM contracts exhibit a narrower and more centered distribution of daily returns compared to the wider, left-skewed distribution of OTM options. This pattern indicates that ITM options deliver more stable returns, consistent with the notion that retail investors are drawn to their higher likelihood of generating positive outcomes in short-term strategies. In contrast, Panel B shows that for long-maturity contracts, the differences between ITM and OTM options are less pronounced. Quantitatively, for short-maturity options, the mean (median) daily return of ITM contracts is 0.6% (0.1%), compared to 6% (0.3%) for OTM options; however, the mean of negative daily returns for OTM options (-9.6%) is substantially lower than that of ITM options (-1%), underscoring the higher downside risk of OTM positions. For long maturities, this pattern largely disappears, as the mean (median) daily returns of ITM and OTM options converge to 0.3% (0%) and 2.7% (0%), respectively.

Overall, the results reveal a strong and economically significant link between social media–driven attention and option trading activity, particularly among retail investors. Abnormal posting activity on StockTwits is associated with substantial increases in option dollar volume across all moneyness categories, with the most pronounced effects observed for short-term ITM and OTM contracts. Retail investors show a distinct preference for ITM options following surges in online attention, while this relationship weakens for longer maturities and is largely absent among professional and institutional traders. Moreover, when isolating posts specifically related to options, the association between abnormal StockTwits activity and trading volume becomes even stronger. Figure 8 illustrates that retail investors often discuss ITM options as safer and more consistent instruments, emphasizing their higher probability of profit and lower downside risk. This behavior aligns with the concept of preferred habitat investors (Vayanos and Vila, 2021), who overallocate to a specific market segment that best fits their financial constraints or risk preferences. In this context, retail traders with limited capital and moderate risk tolerance appear to favor ITM options as an affordable mean of obtaining equity exposure.

6. Conclusion

This paper examines the economic motives and performance of retail investors in the equity options market, providing new insights into why unsophisticated traders allocate a substantial share of their portfolios to ITM options. Using one of the most comprehensive open–close datasets available, covering about 70 percent of the market between 2014 and 2022, I document that small customers trading fewer than 100 contracts per day concentrate roughly 40 percent of their total dollar investment in low-leverage ITM options. This finding challenges the conventional view that retail investors primarily engage in speculative, lottery-like behavior through OTM contracts. Instead, retail traders appear to pursue short-term, low-leverage strategies that mimic stock exposure, particularly in large, stable, and high-priced firms.

I show that the concentration of retail activity in ITM options is not random but shaped by financial constraints and perceived risk preferences consistent with the preferred habitat framework. Retail investors allocate disproportionately to low-leverage ITM contracts as an affordable means to gain exposure to high-priced stocks, while avoiding the high volatility and lower success probabilities of OTM options. A regression discontinuity design identifies a distinct affordability threshold at a stock price of approximately \$550, above which retail demand for ITM options declines sharply.

Performance analysis reveals that ITM options systematically underperform in dollar terms, with losses concentrated in short maturities of less than one week and amplified for high-priced stocks. These findings indicate that retail investors, acting as preferred-habitat traders, willingly forgo expected gains for exposure to derivatives that offer a higher perceived probability of success. In contrast, professionals and firms do not exhibit the same trading or performance patterns, underscoring that this behavior is unique to retail participants.

Finally, linking option trading to social media data from StockTwits reveals that abnormal retail attention significantly correlated with option dollar volume across all moneyness categories. The effect is strongest for short-term ITM and OTM options, and intensifies when posts explicitly reference option trading. Qualitative evidence from online discussions confirms that retail investors perceive ITM options as safer and more consistent vehicles for profit, reinforcing the preferred-habitat interpretation.

Overall, these results reveal that retail investors occupy a distinct habitat within the options market, concentrating their limited capital in low-leverage, short-maturity ITM contracts that provide affordable exposure to equities but yield persistent losses. This study broadens our understanding of retail behavior beyond pure speculation, showing that retail trading in options is not solely driven by gambling preferences but also by structural constraints and behavioral perceptions of safety. The findings have broader implications for assessing market segmentation, investor welfare, and the growing influence of social media on retail participation in derivative markets.

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Figure 1. Exchange Volume Coverage

This figure shows the monthly aggregated volume of options of stocks with share code 10 or 11 from CRSP at the contract-day level, as percentage of the total volume reported on Optionmetrics. The sample period is from January 1, 2012, to December 31, 2022.

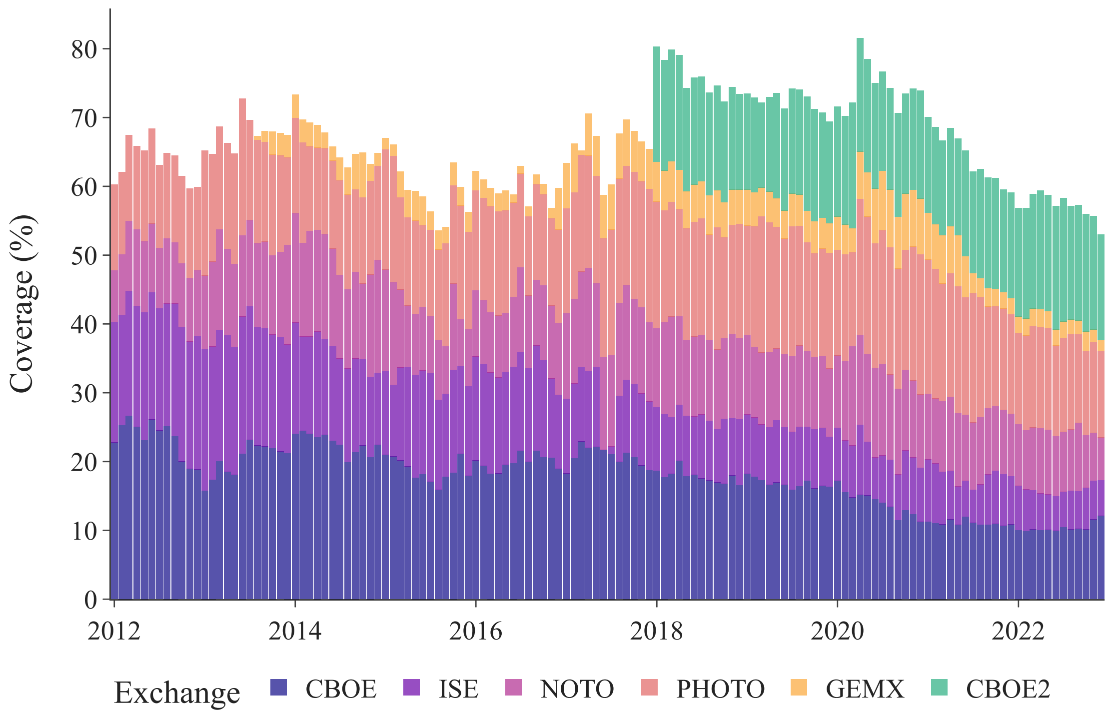
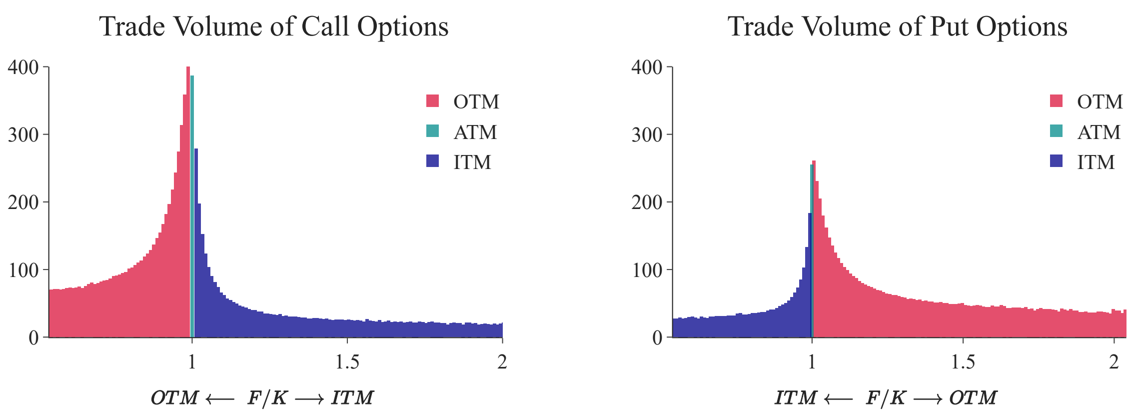


Figure 2. Average Trade and Dollar Volume of options traded by Small Customers

This figure displays the average stock-daily trade volume in Panel A (number of trades) and the average stock-daily dollar volume in Panel B (US Dollars), segmented by different levels of moneyness for call and put options traded by small customers. The level of moneyeness F/K is calculated as the ratio between the forward price of the stock (F) and the strike price of the option contract (K). The sample period January 2014 to December 2022 for options of all stocks considered in the analysis.

Panel A: Trade Volume of Small Customers



Panel B: Dollar Volume of Small Customers

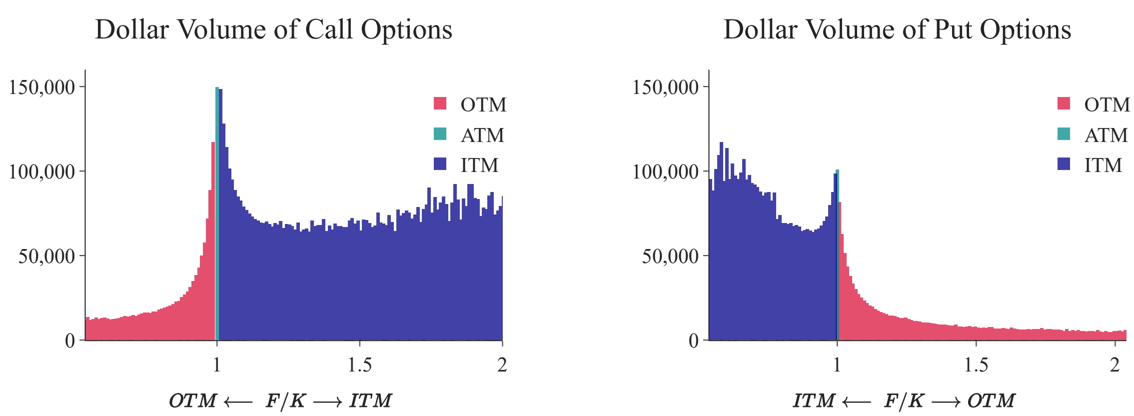
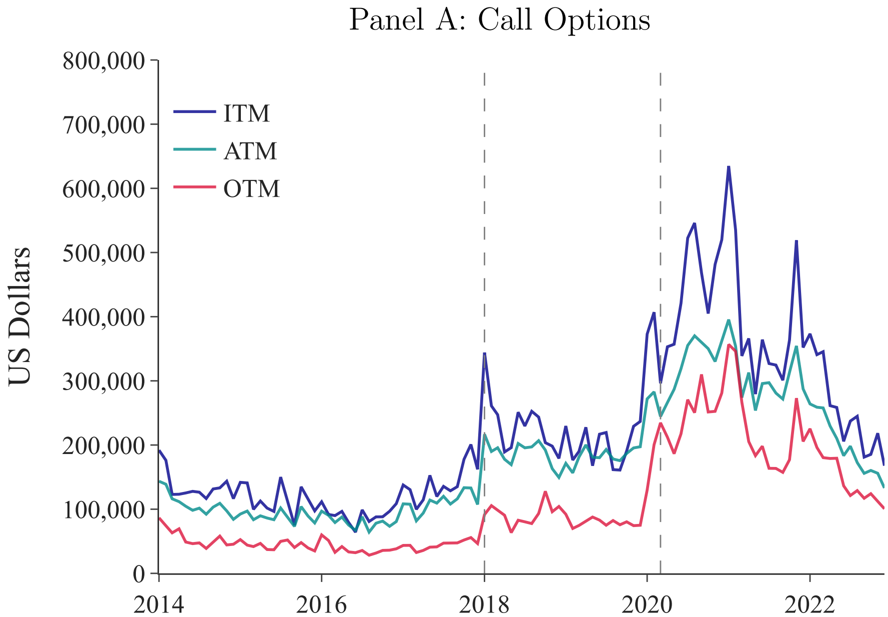


Figure 3. Dollar Volume of options traded by Small Customers

This figure shows the daily average dollar volume at the stock-daily level for different type of moneyness: ITM, OTM and ATM. Moneyness of an option is calculated the ratio (F/K) between the forward price of the stock (F) and the strike price of the option contract (K). For call options, if $F/K < 0.975$, the contract is considered to be OTM, while if $F/K > 1.025$, it is ITM. Conversely, for put options, if $F/K < 0.975$, the contract is ITM, and if $F/K > 1.025$, it is OTM.



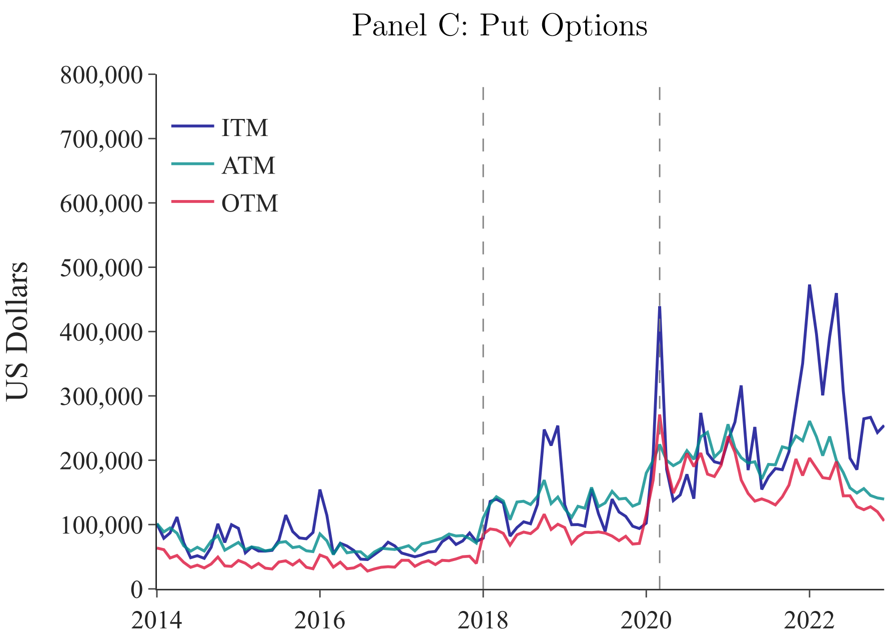
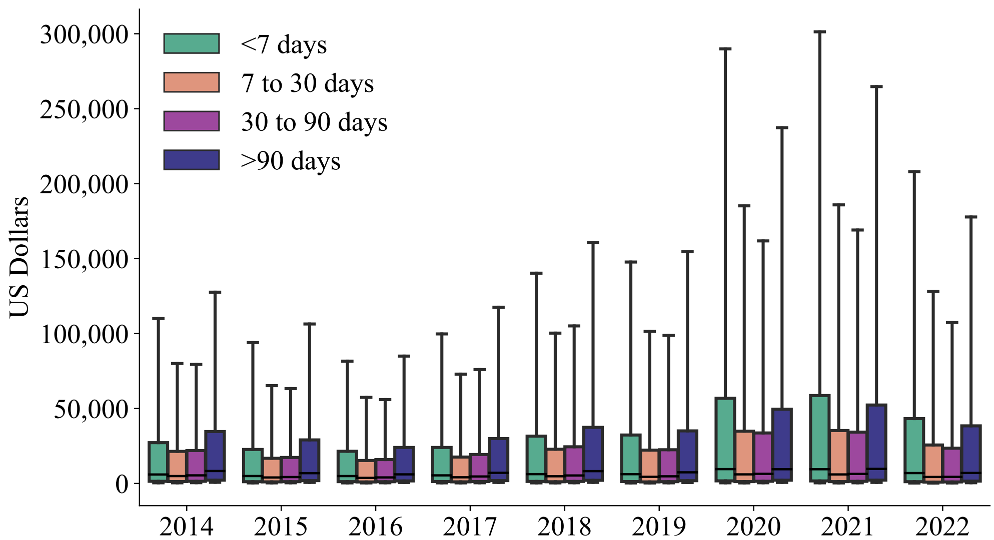


Figure 4. Dollar Volume by Maturity of Call options traded by Small Customers

This figure shows box plot of the stock-daily dollar volume for ITM Call (Panel A) and OTM Call (Panel B) options with different buckets of maturity. The arms of the box plot represent the 10th and 90th percentile of the distribution. The upper (lower) edge of the box represents the 75th (25th) percentile. The sample period January 2014 to December 2022 for options of all stocks considered in the analysis.

Panel A: ITM Call Options



Panel B: OTM Call Options

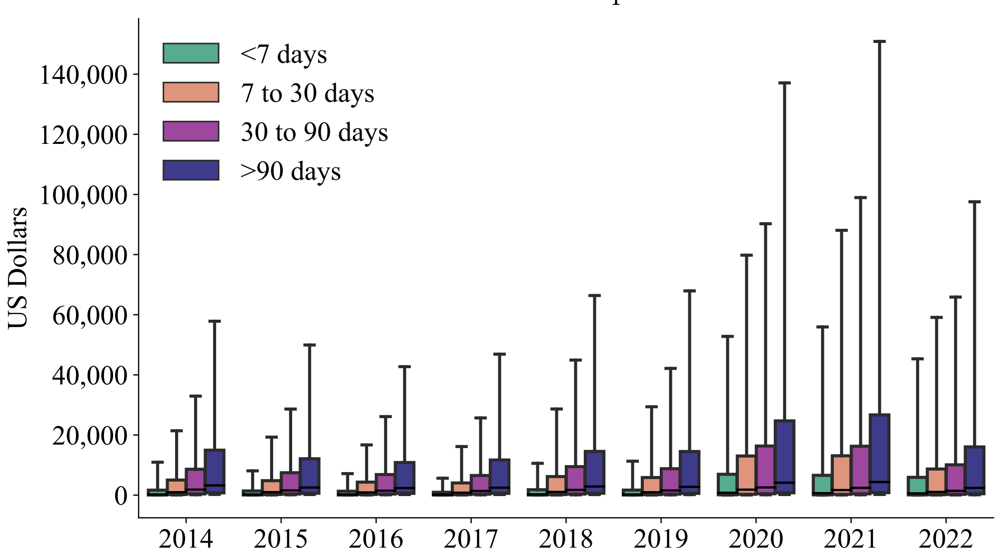


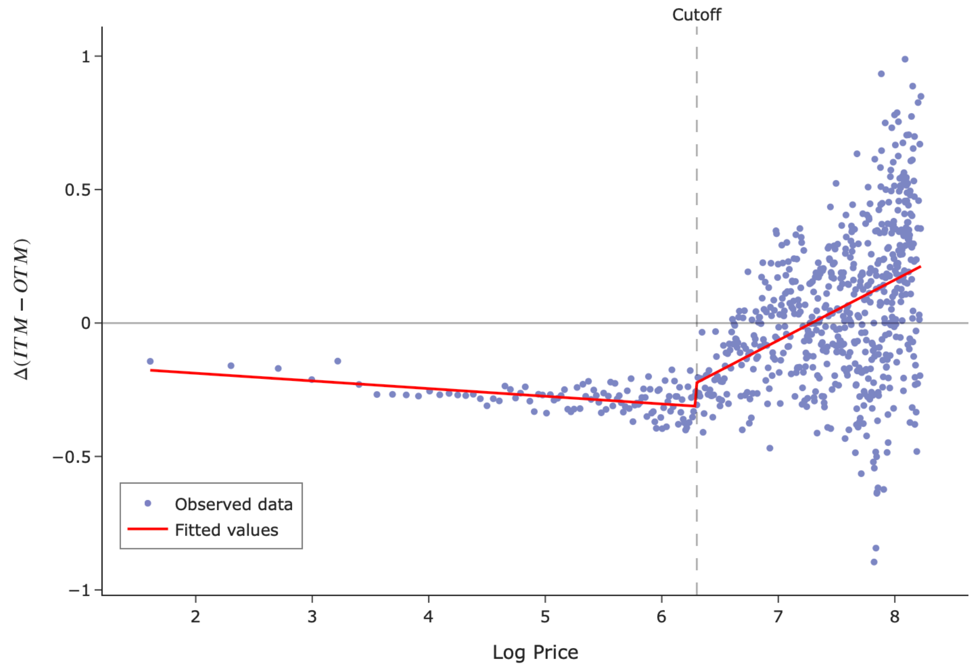
Figure 5. Demand for ITM vs OTM Call Options across Stock Prices for Small Customers

This figure plots the observed data and fitted values from the regression discontinuity design (RDD) . The RDD exploits variation in the relative ITM–OTM trading measure defined as:

$$Delta(ITM - OTM)_{j,t} = \frac{(ITM - OTM)_{j,t}}{(ITM + OTM)_{j,t}}$$

, and the log of the underlying stock price, as the running variable. The vertical dashed line marks the estimated cutoff around a log stock price

Panel A. Regression Discontinuity Design



Panel B. RDD: Cutoff Level Minimizing MSE

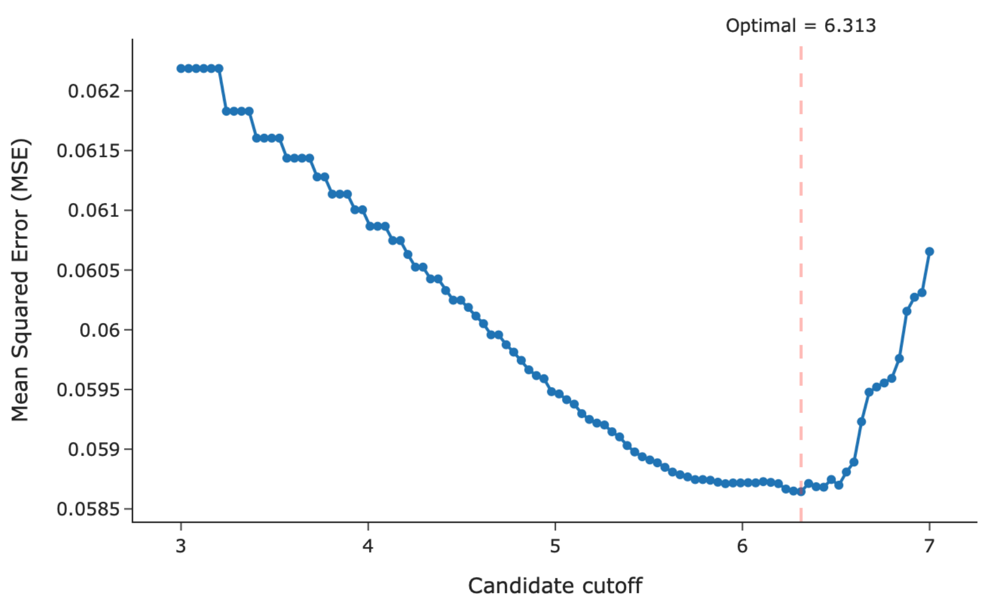


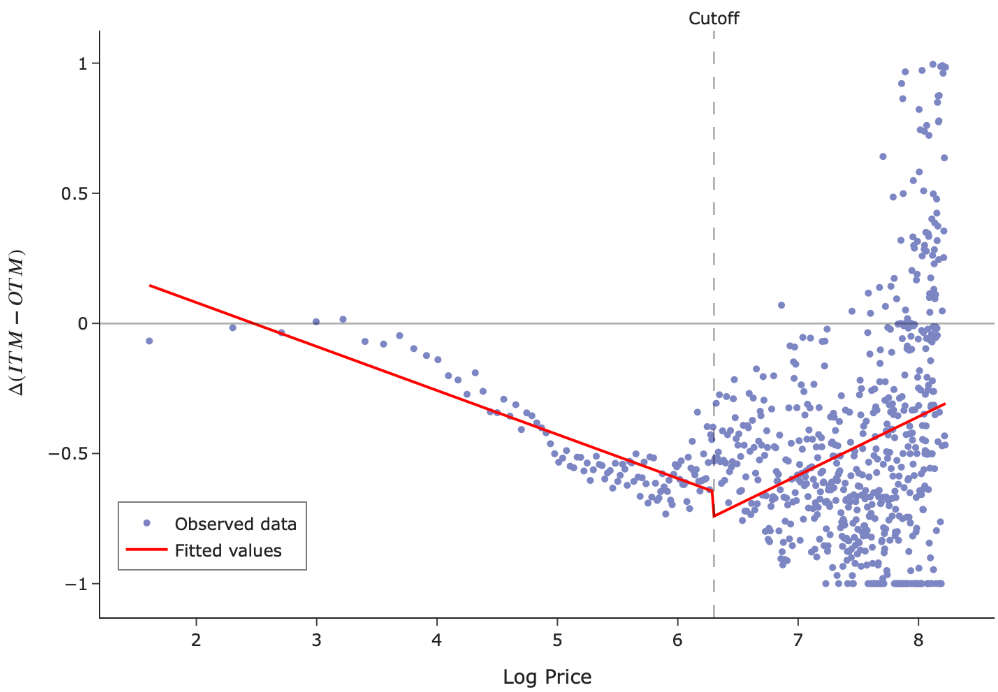
Figure 6. Demand for ITM versus OTM Call Options across Stock Prices

This figure plots the observed data and fitted values from the regression discontinuity design (RDD) . The RDD exploits variation in the relative ITM–OTM trading measure defined as:

$$Delta(ITM - OTM)_{j,t} = \frac{(ITM - OTM)_{j,t}}{(ITM + OTM)_{j,t}}$$

, and the log of the underlying stock price, as the running variable. The vertical dashed line marks the estimated cutoff around a log stock price

Panel A. Professional Customers



Panel B. Firms

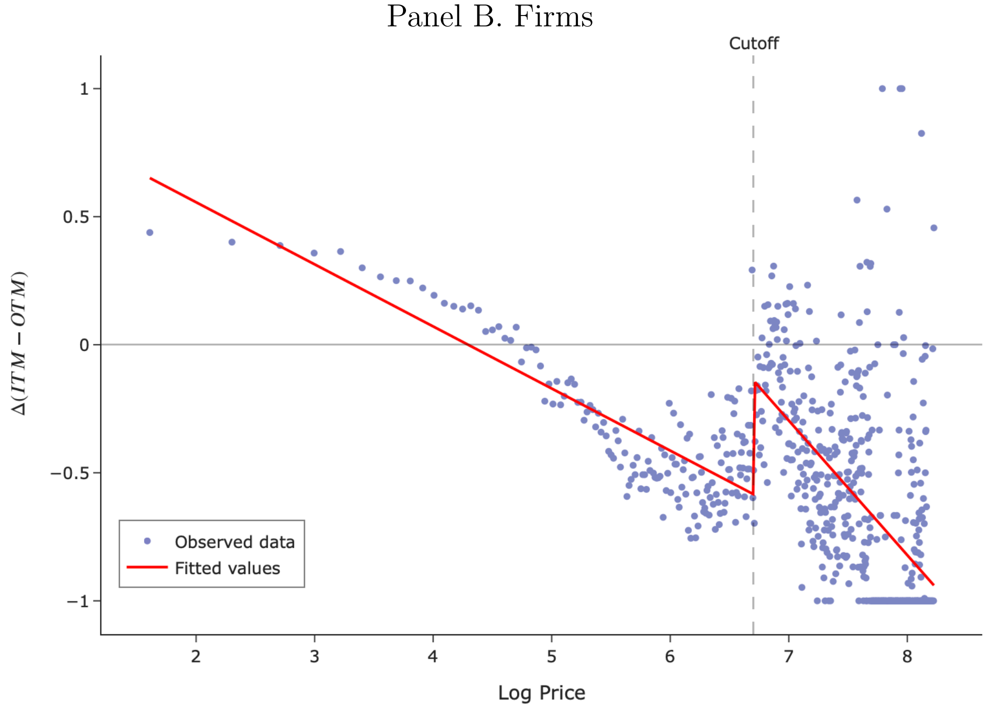
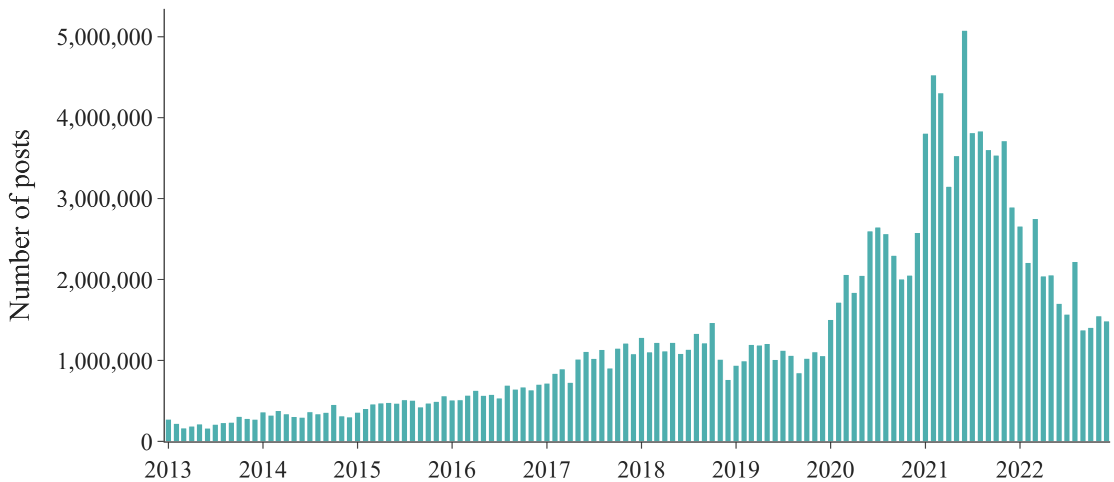


Figure 7. Information production on Stocktwits

This figure shows the monthly number of stock-specific posts on StockTwits on Panel A. The monthly number of stock-specific posts related to option trading on Stockstwtis on Panel B. The sample period is from January 1, 20134, to December 31, 2022.

Panel A: Number of stock-specific posts on StockTwits



Panel B: Number of stock-specific posts on StockTwits related to option trading

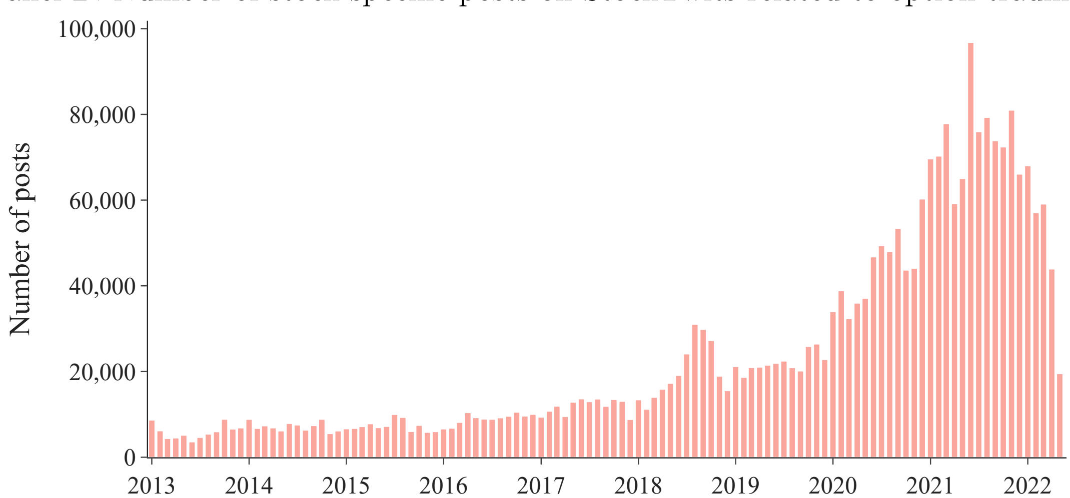


Figure 8. Why ITM options?: evidence from Stocktwits

This figure provides examples of posts from StockTwits that highlight retail investors' discussions about their motives for trading ITM options.

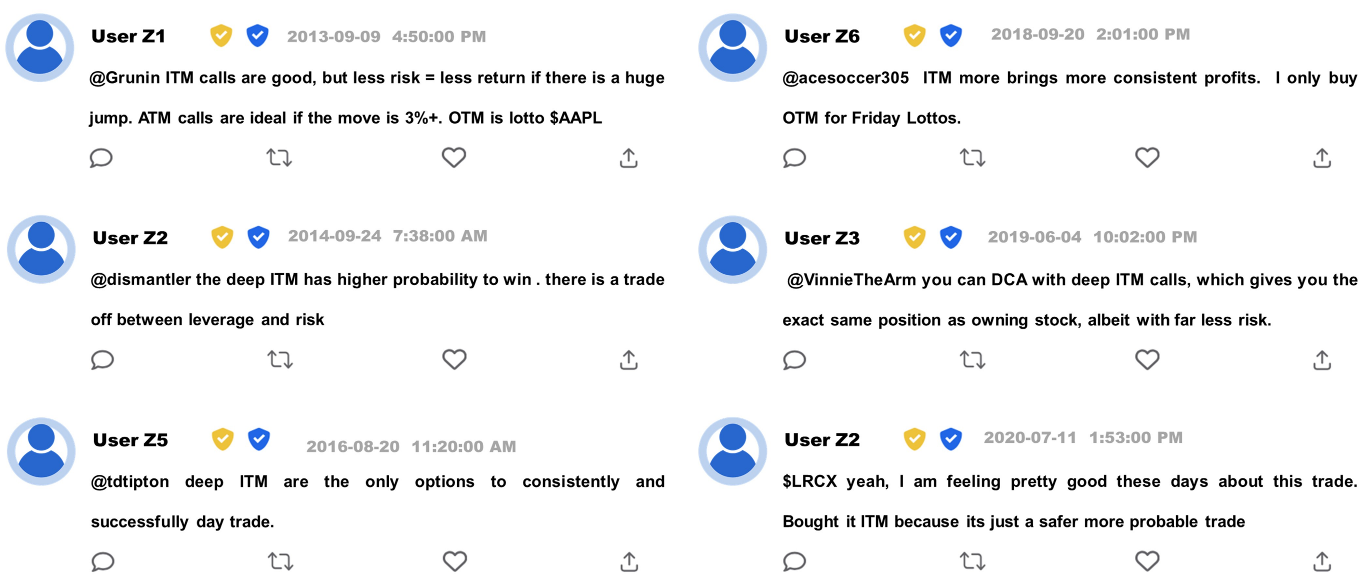
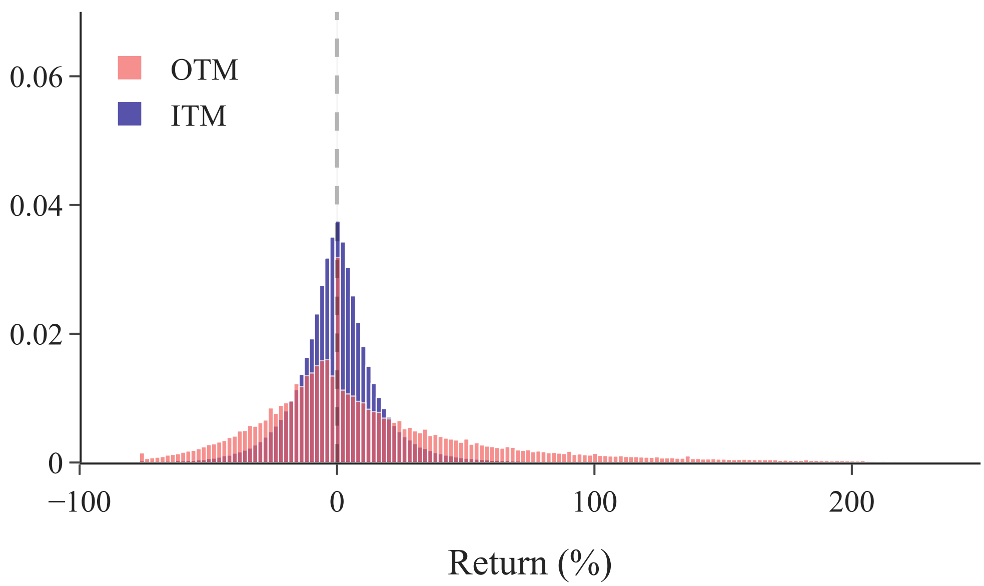


Figure 9. Call options stock-daily return distribution

This figure shows the distribution of the daily returns of call options traded by small customers, expressed in percentage (%), averaged for each underlying stock. Panel A considers all options with short maturity (less than 7 days) and Panel B considers all options with long maturity (more than 90 days). The sample period covers January 1, 2014, to December 31, 2022.

Panel A: Short Maturity Call Options



Panel B: Long Maturity Call Options

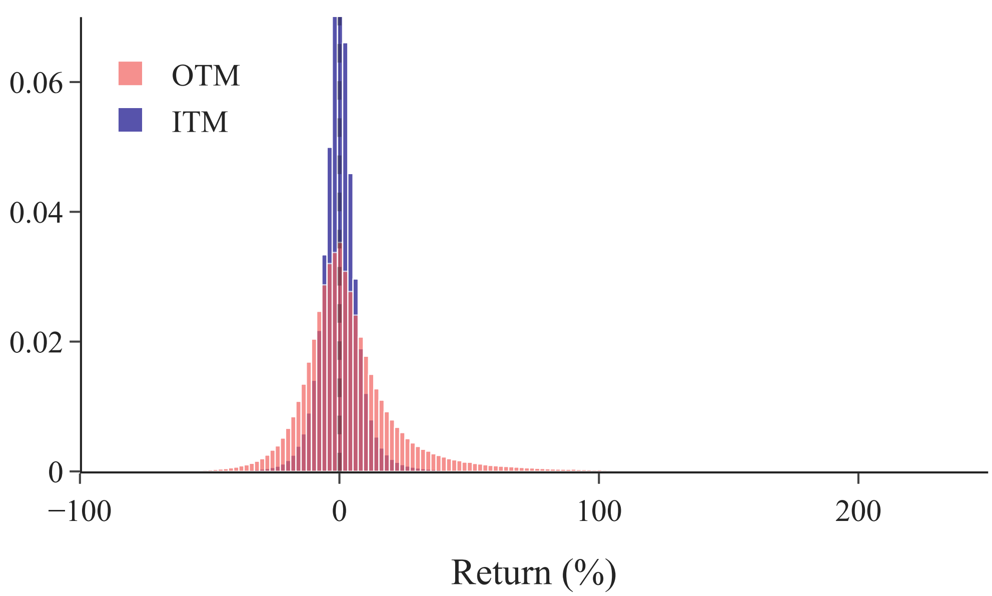


Table 1
Database characteristics

This table reports the average, per year, of the number of unique option contracts, unique stocks, and option observations considered in the database after merging all exchanges considered, at the option contract-daily level, of options traded by small customers, professionals and, firms. The sample period is from January 1, 2014, to December 31, 2022.

Year	# of unique option contracts	# of option observations	# of unique stocks
2014	2,327,362	110,472,482	2,861
2015	2,738,454	126,585,514	3,070
2016	2,740,471	126,354,540	3,003
2017	2,732,423	125,651,794	2,920
2018	3,034,317	134,938,416	2,884
2019	3,032,442	139,029,998	2,840
2020	3,660,093	169,408,389	2,931
2021	4,018,838	200,778,913	3,501
2022	3,907,593	193,689,127	3,481

Table 2
Summary Statistics of Equity Options Dollar Volume by Investor

This table reports the summary statistics the daily-stock average of the dollar volume traded in equity options traded by small customers, professionals and, firms. The sample period is from January 1, 2014, to December 31, 2022.

A. Call Options

	Small Customers			Professionals			Firms		
	ITM	OTM	ATM	ITM	OTM	ATM	ITM	OTM	ATM
Mean	201,629	102,435	172,036	28,755	23,490	26,556	51,416	42,830	47,811
5th	305	52	180	320	52	174	254	60	120
25th	1,890	550	1,335	1,438	526	1,233	1,275	560	900
Median	8,970	3,255	6,910	5,355	2,685	5,018	5,541	3,540	4,945
75th	49,285	20,590	39,912	20,000	13,660	19,825	29,242	22,250	27,318
95th	645,062	292,972	516,900	143,414	121,125	125,842	312,400	260,402	290,176
Total (%)	(42%)	(29%)	(29%)	(21%)	(42%)	(38%)	(23%)	(44%)	(33%)

B. Put Options

	Small Customers			Professionals			Firms		
	ITM	OTM	ATM	ITM	OTM	ATM	ITM	OTM	ATM
Mean	147,026	87,552	125,147	33,813	24,987	28,541	67,924	50,753	51,799
5th	242	50	145	368	73	212	277	62	127
25th	1,410	472	983	1,865	742	1,470	1,725	652	1,095
Median	6,450	2,700	4,890	7,121	3,572	5,762	9,350	4,465	6,225
75th	35,185	17,000	28,872	26,790	16,125	22,530	53,808	29,235	34,258
95th	459,870	237,745	347,150	154,402	128,696	136,442	314,512	312,400	312,400
Total (%)	(38%)	(32%)	(29%)	(24%)	(39%)	(37%)	(24%)	(45%)	(31%)

Table 3
Dollar Volume Difference between ITM and OTM Options by Investor

This table reports the coefficients from the following regression model:

$$(\text{ITM} - \text{OTM})_{j,t} = \beta_1 \mathbb{1}^{<7}_{j,t} + \beta_2 \mathbb{1}^{7-30}_{j,t} + \beta_3 \mathbb{1}^{30-90}_{j,t} + \beta_4 \mathbb{1}^{90-120}_{j,t} + \beta_5 \mathbb{1}^{>120}_{j,t} + \alpha_j + \alpha_t + \varepsilon_{j,t}.$$

The dependent variable is the daily difference between the dollar trading volume of ITM and OTM options for stock j on day t. The indicators $\mathbb{1}^{x}_{j,t}$ denote maturity categories based on days to expiration. α_j and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses.

	ITM-OTM Call Options			ITM-OTM Put Options		
	Small Customers	Professionals	Firms	Small Customers	Professionals	Firms
$\mathbb{1}^{<7}$	204.38***	106.05***	194.73***	166.27***	-651.08*	103.62
	(20.06)	(16.01)	(11.82)	(20.15)	(370.40)	(70.64)
$\mathbb{1}^{30-90}$	-38.13***	-46.00***	-117.51***	-56.39***	97.63	-237.49***
	(6.74)	(8.63)	(8.21)	(8.99)	(345.45)	(58.92)
$\mathbb{1}^{90-120}$	-69.59***	-64.41***	-109.20***	-8.96	-637.87**	-341.23***
	(9.97)	(11.29)	(22.05)	(13.13)	(317.64)	(57.66)
$\mathbb{1}^{>120}$	12.54	-102.69***	-325.69***	32.87**	-146.79	-529.44***
	(9.48)	(27.81)	(15.02)	(16.73)	(240.77)	(73.78)
Intercept	35.70***	-0.04	-1.03	-9.84	499.82**	215.59***
	(4.64)	(8.21)	(5.48)	(6.59)	(222.48)	(39.45)
N	9,296,261	2,114,293	1,594,284	7,066,723	1,981,679	1,249,875
R^2	0.007	0.010	0.124	0.005	0.004	0.028

Table 4
ITM minus OTM Dollar Volume and Stock Market Capitalization

This table reports the daily-stock average of the difference between dollar volume of ITM minus OTM options ($DollarVolume^{ITM-OTM}$) traded by small customers, and their respective market capitalization quintiles of their stock underlying. Panel A reports data for call options, while Panel B focuses on put options. The sample period spans from January 1, 2014, to December 31, 2022.

A. Call options

Top 15			Bottom 15		
Underlying ticker	Market Cap Quintile	$DollarVolume^{ITM-OTM}$	Underlying ticker	Market Cap Quintile	$DollarVolume^{ITM-OTM}$
AAPL	5	4,796,994	SNOW	5	-210,806
GOOGL	5	4,789,816	BFT	3	-219,696
META	5	3,614,172	CCIV	3	-239,534
AMZN	5	3,576,562	DPHC	3	-251,829
NFLX	5	2,119,205	CLOV	1	-261,981
MSFT	5	2,047,937	RBLX	5	-264,911
NVDA	5	1,880,446	AMC	2	-285,961
PCLN	5	1,499,945	FUBO	2	-315,851
TSLA	5	1,498,462	SHLL	2	-316,542
BRK	5	1,331,174	ABNB	5	-337,648
BAC	5	1,233,561	GME	3	-344,597
CMG	5	1,071,563	RIVN	5	-489,506
MU	5	888,526	SPAQ	1	-533,808
TTD	5	874,276	COIN	5	-797,551
BKNG	5	849,965	PLTR	5	-857,568

B. Put options

Top 15			Bottom 15		
Underlying ticker	Market Cap Quintile	$DollarVolume^{ITM-OTM}$	Underlying ticker	Market Cap Quintile	$DollarVolume^{ITM-OTM}$
UPST	3	1,447,092	COST	5	-58,751
COIN	5	1,271,515	AVGO	5	-59,620
RIVN	5	972,828	UNH	5	-61,746
HOOD	4	864,491	ACT	3	-74,092
PLTR	5	852,339	GREE	1	-103,824
CCIV	3	817,786	ZS	5	-132,575
DKNG	4	805,457	CRWD	5	-136,216
ROKU	4	794,407	SHLL	2	-173,905
QS	3	727,157	QCOR	4	-266,256
SOFI	4	692,701	AAPL	5	-266,531
BYND	1	675,030	GOOGL	5	-331,762
LCID	4	668,683	NFLX	5	-356,631
AFRM	4	668,510	TSLA	5	-518,632
RBLX	5	631,168	NVDA	5	-823,097
DWAC	1	624,715	AMZN	5	-896,716

Table 5
Dollar Performance of options traded by Small Customers

This table reports the coefficients of the following regression

$$\$PerfNOI_{i,j,t-1:t} = \beta_1 \mathbb{1}^{\text{ITM}}_{i,j,t} + \beta_2 \mathbb{1}^{\text{OTM}}_{i,j,t} + \beta_3 \mathbb{1}^{\text{ATM}}_{i,j,t} + \alpha_j + \alpha_t + \varepsilon_{j,t}$$

Where $\$PerfNOI_{j,t-1,t}$ is the dollar performance of option contract i to the return of its underlying stock j from $t-1$ to t, defined in Equation 4. α_j and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. Call options

	Small Customers				
	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	More than 120 days
$\mathbb{1}^{\text{ITM}}$	-23,784.04***	-3,786.16	-5,593.15***	-987.28**	-1,626.42
	(5,689.36)	(5,102.72)	(1,671.79)	(413.03)	(1,199.50)
$\mathbb{1}^{\text{OTM}}$	14,323.84***	-1,121.30	-2,543.61*	-451.75	-1,673.50
	(4,507.56)	(3,324.08)	(1,516.80)	(445.50)	(1,110.60)
$\mathbb{1}^{\text{ATM}}$	4,786.60	-300.68	-1,447.72	150.53	-287.58
	(4,513.53)	(3,028.73)	(1,487.49)	(439.81)	(1,102.16)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.005	0.000	0.003	0.002	0.001

B. Put options

	Small Customers				
	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	More than 120 days
$\mathbb{1}^{\text{ITM}}$	-11,306.55**	-8,001.69***	-1,117.25**	-1,629.30**	-370.08
	(4,569.29)	(2,801.19)	(435.33)	(781.98)	(563.16)
$\mathbb{1}^{\text{OTM}}$	1,291.13	-1,469.36	119.96	-1,178.33	-373.66
	(4,556.35)	(2,565.26)	(441.24)	(788.59)	(578.86)
$\mathbb{1}^{\text{ATM}}$	-4,916.27	-1,885.81	444.18	-954.98	22.56
	(4,516.61)	(2,589.15)	(457.59)	(795.32)	(604.97)
N	1,859,936	3,738,766	4,187,094	1,193,384	3,218,814
R^2	0.005	0.004	0.003	0.003	0.001

Table 6
Dollar Performance of Options Traded by Small Customers on High-Price Stocks

This table reports the coefficients of the following regression

$$\$PerfNOI_{i,j,t-1:t} = \beta_1 \mathbb{1}^{\text{ITM}}_{i,j,t} + \beta_2 \mathbb{1}^{\text{High-Price}}_{j} + \beta_3 \mathbb{1}^{\text{ITM}}_{i,j,t} \times \mathbb{1}^{\text{High-Price}}_{j} + \alpha_j + \alpha_t + \varepsilon_{j,t}$$

Where $\$PerfNOI_{j,t-1,t}$ is the dollar performance of option contract i to the return of its underlying stock j from $t-1$ to t, defined in Equation 4. α_j and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. ITM options

	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	more than 120 days
$\mathbb{1}^{ITM}$	-28,273.30***	-1,706.80	-3,041.60***	-789.01***	-220.56
	(5,233.22)	(6,693.73)	(456.57)	(210.41)	(200.62)
$\mathbb{1}^{HighPrice}$	-87,568.33*	-17,120.42*	1,250.05	-1,143.64	163.94
	(46,780.23)	(10,237.16)	(4,135.68)	(3,087.01)	(5,176.23)
$\mathbb{1}^{\text{ITM}} \times \mathbb{1}^{\text{High-Price}}$	-215,656.29***	-97,972.19***	-36,179.64**	3,462.61	-12,783.52*
	(72,678.13)	(24,902.89)	(17,655.71)	(5,279.77)	(7,713.02)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.014	0.000	0.006	0.002	0.002

B. OTM options

	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	more than 120 days
$\mathbb{1}^{\text{OTM}}$	16,573.77***	290.77	914.63***	48.98	-568.94***
	(2,228.34)	(3,375.48)	(214.62)	(134.05)	(124.61)
$\mathbb{1}^{HighPrice}$	-210,895.09***	-57,086.75***	-10,222.46	870.75	-3,179.68
	(73,399.61)	(17,977.54)	(6,365.76)	(3,589.83)	(5,017.49)
$\mathbb{1}^{\text{OTM}} \times \mathbb{1}^{\text{High-Price}}$	189,542.70***	37,585.80***	3,626.92	-2,651.12	-1,459.63
	(41,465.05)	(13,359.40)	(8,440.65)	(3,407.16)	(4,863.74)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.011	0.000	0.001	0.000	0.001

C. ATM options

	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	more than 120 days
$\mathbb{1}^{\text{ATM}}$	5,923.54***	1,170.72	1,853.04***	805.74***	1,159.09***
	(2,174.51)	(2,082.27)	(238.88)	(83.30)	(103.80)
$\mathbb{1}^{HighPrice}$	-140,789.13**	-60,697.41***	-19,010.76**	-13.28	-8,077.79
	(64,525.45)	(17,483.98)	(7,471.81)	(4,481.44)	(5,307.13)
$\mathbb{1}^{\text{ATM}} \times \mathbb{1}^{\text{High-Price}}$	-5,184.90	47,151.27***	28,407.74***	-497.12	13,823.75**
	(34,368.61)	(14,060.96)	(10,370.48)	(3,737.55)	(5,380.68)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.004	0.000	0.003	0.001	0.004

Table 7
Dollar Performance of options traded by Professional Customers and Firms

This table reports the coefficients of the following regression

$$\$PerfNOI_{i,j,t-1:t} = \beta_1 \mathbb{1}^{\text{ITM}}_{i,j,t} + \beta_2 \mathbb{1}^{\text{OTM}}_{i,j,t} + \beta_3 \mathbb{1}^{\text{ATM}}_{i,j,t} + \alpha_j + \alpha_t + \varepsilon_{j,t}$$

Where $\$PerfNOI_{j,t-1,t}$ is the dollar performance of option contract i to the return of its underlying stock j from $t-1$ to t, defined in Equation 4. α_j and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. Professional Customers

	Small Customers				
	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	more than 120 days
$\mathbb{1}^{\text{ITM}}$	1,182.01	425.84	-53.31	-2.40	-20.03*
	(749.02)	(327.03)	(57.59)	(30.46)	(10.32)
$\mathbb{1}^{HighPrice}$	9,505.73*	309.66	882.24	2,441.62	-1,059.73
	(5,063.39)	(1,492.79)	(934.90)	(4,689.46)	(954.13)
$\mathbb{1}^{\text{ITM}} \times \mathbb{1}^{\text{High-Price}}$	2,321.01	-11,155.25	-2,123.38**	-2,435.94	-1,710.51
	(7,533.42)	(7,432.20)	(990.35)	(3,884.51)	(1,771.01)
Intercept	45.01	-18.79	104.31***	34.99	51.54***
	(228.21)	(95.45)	(17.62)	(58.49)	(11.91)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.001	0.001	0.000	0.001	0.005

B. Firms

	Small Customers				
	Less than 7 days	8 to 30 days	31 to 90 days	91 to 120 days	more than 120 days
$\mathbb{1}^{\text{ITM}}$	5,027.08***	-1,416.05	530.60***	-29.23	1.42
	(1,511.45)	(2,503.31)	(183.02)	(82.26)	(44.75)
$\mathbb{1}^{HighPrice}$	748.80	2,292.45	-1,089.03	-221.52	-259.22
	(4,159.30)	(1,683.41)	(1,443.07)	(1,281.33)	(947.95)
$\mathbb{1}^{\text{ITM}} \times \mathbb{1}^{\text{High-Price}}$	5,746.52	473.28	-151.37	-4,898.48	-3,373.42
	(7,416.47)	(4,665.47)	(3,132.92)	(3,094.91)	(2,902.04)
Intercept	1,006.88***	497.19	275.25***	152.11***	149.61***
	(382.63)	(625.31)	(48.45)	(31.49)	(17.01)
N	2,138,000	4,635,717	5,419,545	1,752,142	4,782,124
R^2	0.002	0.000	0.000	0.006	0.002

Table 8
Abnormal Dollar Volume of options traded by Small Customers

This table reports the coefficients of the following regression

$$\begin{aligned} AbnVolume(j)_t^M = &\beta_1 AbnPost(j,\tau)_{t-1} + \beta_2 AbnNews(j,\tau)_{t-1} + \beta_3 |Ret(j)_{[t-5,t-1]}| \\ &+ \beta_4 |Ret(j)_{[t-60,t-1]}| + \beta_5 Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t} \end{aligned}$$

Where $AbnVolume(j)_t^M$ represents the abnormal log of option dollar volume for stock j at time t, relative to the average log option dollar volume over the period $[t-60, t-6]$, for different levels of moneyness $M = ITM, OTM, ATM$, traded by small customers. $AbnPost(j,\tau)_{t-1}$ is the abnormal log number of posts average on $[t-5, t-1]$, minus the log number of posts average on $[t-60, t-6]$, of underlying stock j. $AbnNews(j,\tau)_{t-1}$ is the abnormal log number of Ravenpack news average on $[t-5, t-1]$, minus the log number of Ravenpack news average on $[t-60, t-6]$, related to underlying stock j. $|Ret(j)_{[t-5,t-1]}|$, and $|Ret(j)_{[t-60,t-5]}|$ is the total return of stock j, in absolute value, on the periods $[t-5, t-1]$ and $[t-60, t-5]$ respectively. Finally, $Vol(j)_{[t-60,t-1]}$ is the standard deviation of the daily returns of stock j on $[t-60, t-1]$. α_j and α_t correspond to stock and day fixed effects, respectively. Panel A reports data for call options, while Panel B focuses on put options. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. Call Options

	ITM	OTM	ATM
$AbnPosts(\tau)$	0.0054***	0.0059***	0.0037***
	(0.0002)	(0.0002)	(0.0001)
Controls	Yes	Yes	Yes
N	5,174,173	5,174,173	5,174,173
$R^2(\%)$	0.342	0.704	0.353
Firm and date FE	Yes	Yes	Yes

B. Put Options

	ITM	OTM	ATM
$AbnPosts(\tau)$	0.0034***	0.0034***	0.0021***
	(0.0001)	(0.0001)	(0.0001)
Controls	Yes	Yes	Yes
N	5,175,246	5,175,246	5,175,246
$R^2(\%)$	0.237	0.566	0.272
Firm and date FE	Yes	Yes	Yes

Table 9
Abnormal Dollar Volume of options traded by Small Customers by maturity: ITM vs OTM

This table reports the coefficients of the following regression

$$\begin{aligned} AbnVolume(j)_t^{ITM-OTM} =& \beta_1 AbnPost(j,\tau)_{t-1} + \beta_2 AbnNews(j,\tau)_{t-1} + \beta_3 |Ret(j)_{[t-5,t-1]}| \\ &+ \beta_4 |Ret(j)_{[t-60,t-5]}| + \beta_5 Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t} \end{aligned}$$

Where $AbnVolume(j)_t^{ITM-OTM}$ represents the abnormal log of the option dollar volume difference of ITM minus OTM options for stock j at time t, relative to the average of the same variable over the period $[t-60, t-6]$. $AbnPost(j,\tau)_{t-1}$ is the abnormal log number of posts average on $[t-5, t-1]$, minus the log number of posts average on $[t-60, t-6]$, of underlying stock j. $AbnNews(j,\tau)_{t-1}$ is the abnormal log number of Ravenpack news average on $[t-5, t-1]$, minus the log number of Ravenpack news average on $[t-60, t-6]$, related to underlying stock j. $|Ret(j)_{[t-5,t-1]}|$, and $|Ret(j)_{[t-60,t-5]}|$ is the total return of stock j, in absolute value, on the periods $[t-5, t-1]$ and $[t-60, t-5]$ respectively. Finally, $Vol(j)_{[t-60,t-1]}$ is the standard deviation of the daily returns of stock j on $[t-60, t-1]$. α_j and α_t correspond to stock and day fixed effects, respectively. Panel A reports data for call options, while Panel B focuses on put options. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. Call options

	All maturities	Less than 7 days	8 to 30 days	31 to 91 days	More than 91 days
$AbnPosts(\tau)$	-0.0019***	0.0009***	-0.0009***	-0.0014***	-0.0010***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Controls	Yes	Yes	Yes	Yes	Yes
N	5,174,173	1,858,420	4,169,275	4,984,207	5,173,424
$R^2(\%)$	0.011	0.034	0.011	0.014	0.005
Firm and date FE	Yes	Yes	Yes	Yes	Yes

B. Put Options

	All maturities	Less than 7 days	8 to 30 days	31 to 91 days	More than 91 days
$AbnPosts(\tau)$	-0.0006***	0.0006***	-0.0005***	-0.0006***	-0.0001
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Controls	Yes	Yes	Yes	Yes	Yes
N	5,175,246	1,858,251	4,169,726	4,983,969	5,171,578
$R^2(\%)$	0.006	0.003	0.004	0.006	0.006
Firm and date FE	Yes	Yes	Yes	Yes	Yes

Table 10
Abnormal Dollar Volume of options by investor: ITM vs OTM

This table reports the coefficients of the following regression

$$\begin{aligned}AbnVolume_{j,t}^{ITM-OTM} =& \beta_1 AbnPost(j,\tau)_{t-1} + \beta_2 \mathbb{1}_{j,t-1}^{\text{Option}} + \beta_3 AbnPosts(\tau)_{t-1} \times \mathbb{1}_{j,t-1}^{\text{Option}} + \beta_4 AbnNews(j,\tau)_{t-1} \\ &+ \beta_5 |Ret(j)_{[t-5,t-1]}| + \beta_6 |Ret(j)_{[t-60,t-1]}| + \beta_7 Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t}\end{aligned}$$

Where $AbnVolume(j)_t^{ITM-OTM}$ represents the abnormal log of the option dollar volume difference of ITM minus OTM options for stock j at time t, relative to the average of the same variable over the period $[t-60, t-6]$. $AbnPost(j,\tau)_{t-1}$ is the abnormal log number of posts average on $[t-5, t-1]$, minus the log number of posts average on $[t-60, t-6]$, of underlying stock j. $\mathbb{1}_{j,t-1}^{\text{Option}}$ is a dummy variable equal to one if a stock j has at least 60 posts related to option trading in the period $[t-60, t-1]$, or zero otherwise. $AbnNews(j,\tau)_{t-1}$ is the abnormal log number of Ravenpack news average on $[t-5, t-1]$, minus the log number of Ravenpack news average on $[t-60, t-6]$, related to underlying stock j. $|Ret(j)_{[t-5,t-1]}|$, and $|Ret(j)_{[t-60,t-5]}|$ is the total return of stock j, in absolute value, on the periods $[t-5, t-1]$ and $[t-60, t-5]$ respectively. Finally, $Vol(j)_{[t-60,t-1]}$ is the standard deviation of the daily returns of stock j on $[t-60, t-1]$. α_j and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

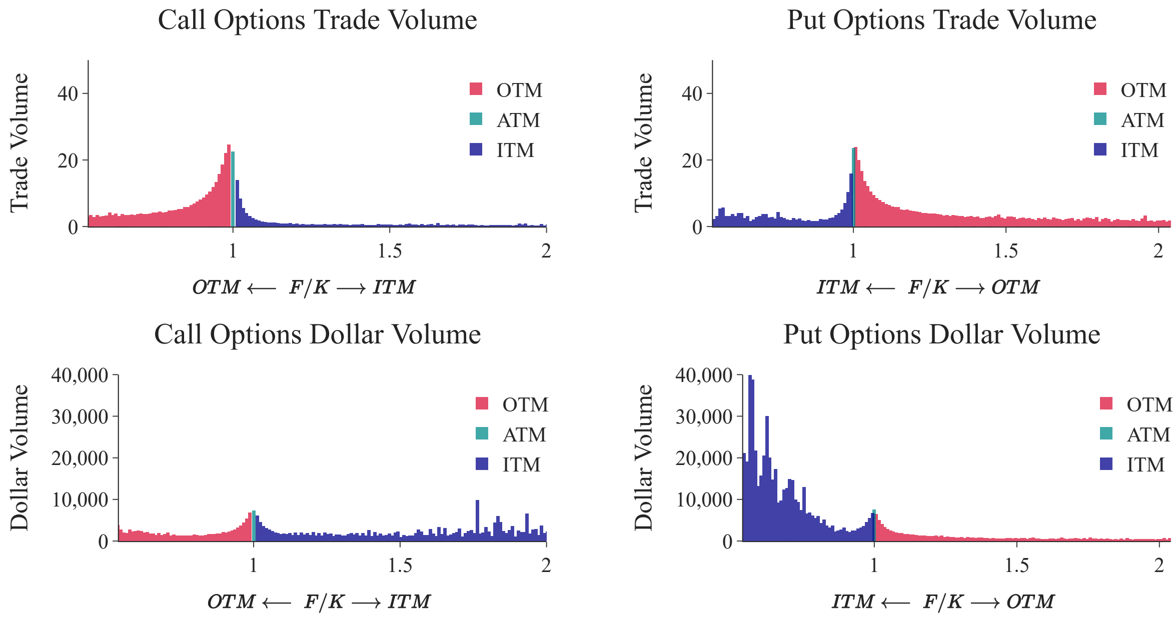
	Small Customers		Professionals		Firms	
	Call	Put	Call	Put	Call	Put
$AbnPosts(\tau)$	-0.0001	-0.0001	0.0000*	0.0001	-0.0001	0.0002**
	(0.0002)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)
$\mathbb{1}^{\text{Option}}$	0.0007**	0.0005*	0.0000	-0.0001	0.0001*	-0.0001
	(0.0003)	(0.0003)	(0.0000)	(0.0001)	(0.0001)	(0.0001)
$AbnPosts * \mathbb{1}^{\text{Option}}$	0.0021***	0.0016***	0.0003***	0.0003***	0.0008***	0.0006***
	(0.0004)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1,858,420	1,858,251	1,858,420	1,858,251	1,858,420	1,858,251
$R^2(\%)$	0.039	0.006	0.007	0.003	0.014	0.009
Firm and date FE	Yes	Yes	Yes	Yes	Yes	Yes

A. Appendix

Figure AA1. Average Trade and Dollar Volume of options traded by Professionals and Firms

This figure displays in Panel A the average stock-daily trade volume and the average stock-daily dollar volume for call and put options traded by professionals and segmented by different levels of moneyness. Panel B shows the average stock-daily trade volume and the average stock-daily dollar volume for call and put options traded by firms and segmented by different levels of moneyness. The level of moneyeness F/K is calculated as the ratio between the Forward Price of the Stock (F) and the Strike Price of the Option Contract (K). The sample period January 2014 to December 2022 for options of all stocks considered in the analysis.

Panel A: Professional investors



Panel B: Firms

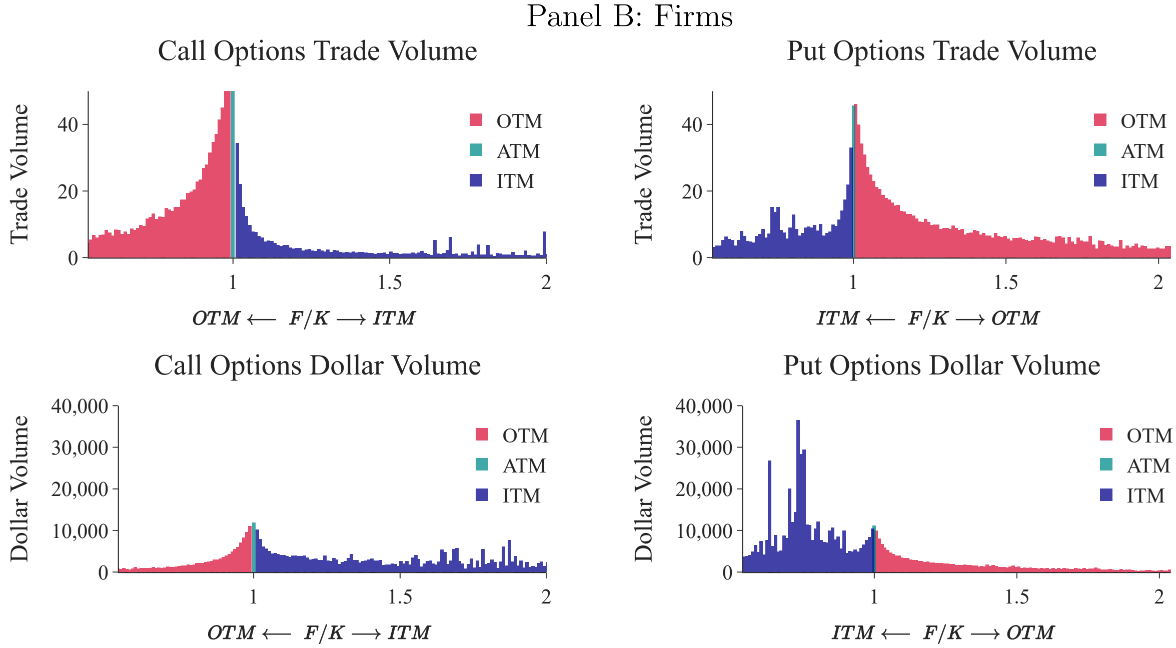
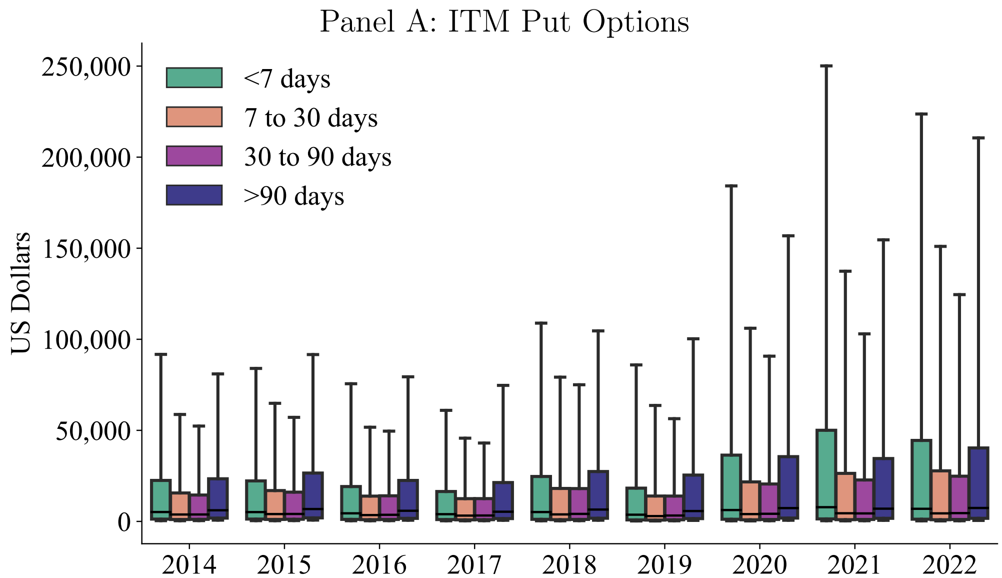


Figure AA2. Dollar Volume by Maturity of Put options traded by Small Customers

This figure shows box plot of the stock-daily dollar volume for ITM Put (Panel A) and OTM Put (Panel B) options with different buckets of maturity. The arms of the box plot represent the 10th and 90th percentile of the distribution. The upper (lower) edge of the box represents the 75th (25th) percentile. The sample period January 2014 to December 2022 for options of all stocks considered in the analysis.



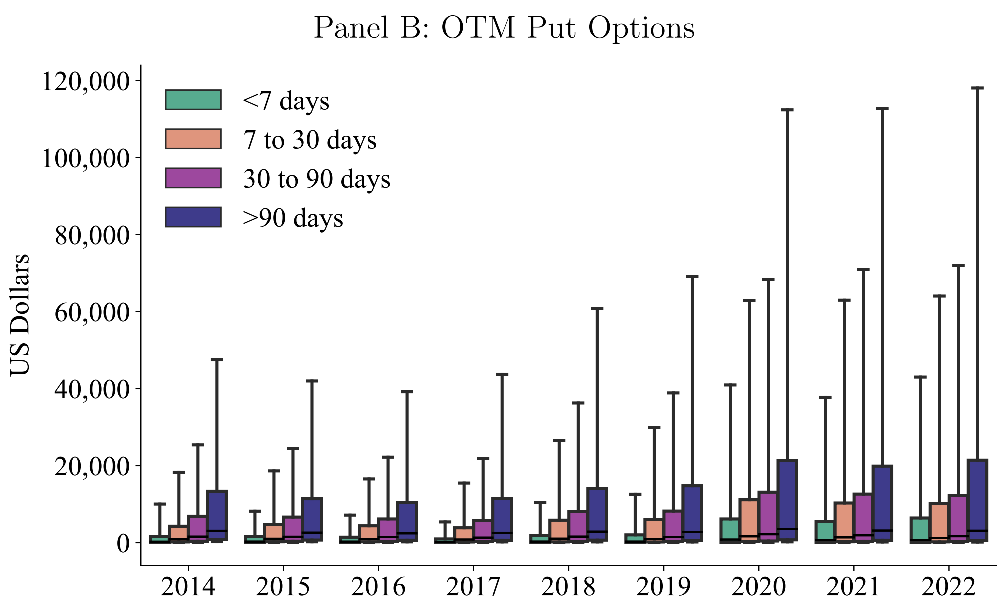


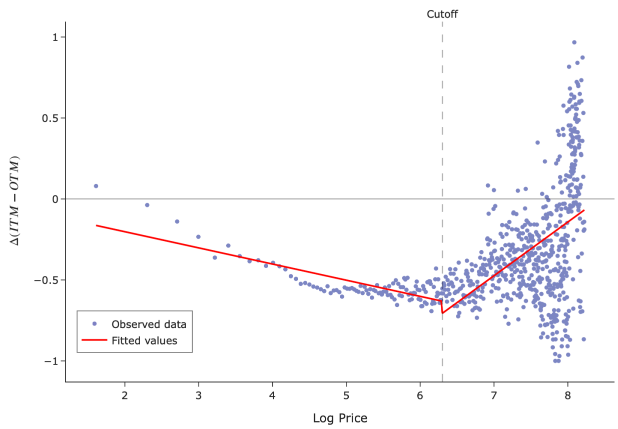
Figure AA3. Demand for ITM versus OTM Put Options across Stock Prices

This figure plots the observed data and fitted values from the regression discontinuity design (RDD) . The RDD exploits variation in the relative ITM–OTM trading measure defined as:

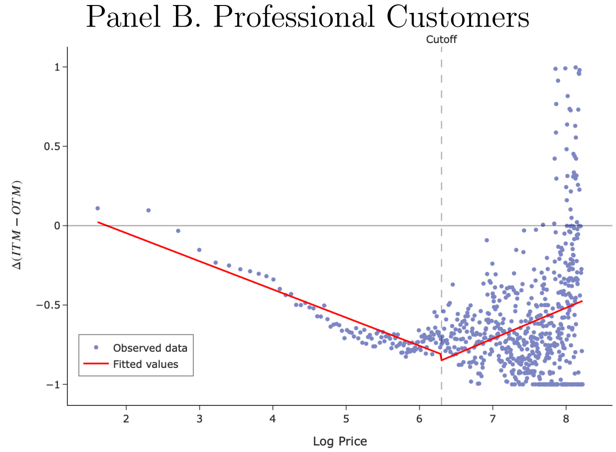
$$Delta(ITM - OTM)_{j,t} = \frac{(ITM - OTM)_{j,t}}{(ITM + OTM)_{j,t}}$$

, and the log of the underlying stock price, as the running variable. The vertical dashed line marks the estimated cutoff around a log stock price

Panel A. Small Customers



Panel B. Professional Customers



Panel C. Firms

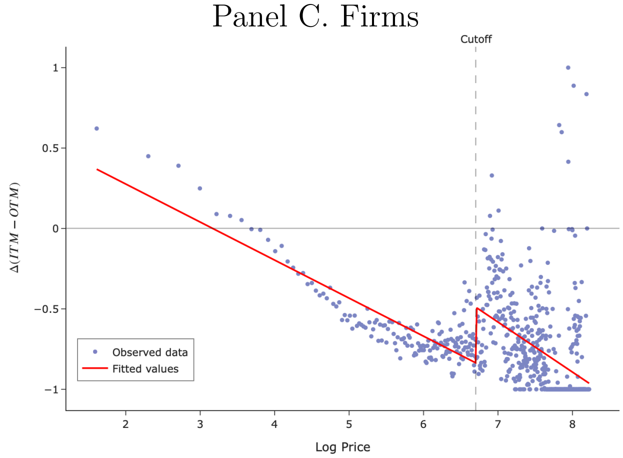


Table 11
Results of the Regression Discontinuity Design Analysis

This table reports the coefficients from a Regression Discontinuity Design (RDD). The RDD exploits variation in the relative ITM–OTM trading measure defined as:

$$\Delta(\text{ITM–OTM})_{j,t} = \frac{V_{j,t}^{\text{ITM}} - V_{j,t}^{\text{OTM}}}{V_{j,t}^{\text{ITM}} + V_{j,t}^{\text{OTM}}},$$

where $V_{j,t}^{\text{ITM}}$ and $V_{j,t}^{\text{OTM}}$ denote the dollar trading volumes of in-the-money (ITM) and out-of-the-money (OTM) options for stock j on day t, respectively. The running variable is the logarithm of the underlying stock price, and a cutoff at a log price of 6.3 (approximately $550) is used for all regressions. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

	Call			Put		
	Small Customers	Professionals	Firms	Small Customers	Professionals	Firms
ln(*price*)	0.09***	-0.09***	0.45***	-0.07***	-0.04	0.35***
	(0.02)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
$>$ *threshold*	-0.03***	-0.17***	-0.24***	-0.10***	-0.18***	-0.24***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ln(*price*)$\times >$ *threshold*	0.26***	0.39***	-0.28***	0.43***	0.37***	-0.07**
	(0.02)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Intercept	-0.31***	-0.65***	-0.58***	-0.63***	-0.81***	-0.84***
	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
R-squared	0.30	0.09	0.39	0.26	0.09	0.31
R-squared Adj.	0.30	0.09	0.39	0.26	0.09	0.31

Table 12
Abnormal Volume of options traded by Professionals and Firms by Maturity

This table reports the coefficients of the following regression

$$
\begin{aligned}
AbnVolume(j)_t^{ITM-OTM} = & AbnPost(j,\tau)_{t-1} + AbnNews(j,\tau)_{t-1} + |Ret(j)_{[t-5,t-1]}| \\
& + |Ret(j)_{[t-60,t-5]}| + Vol(j)_{[t-60,t-1]} + \alpha_j + \alpha_t + \varepsilon_{j,t}
\end{aligned}
$$

Where $AbnVolume(j)_t^{ITM-OTM}$ represents the abnormal log of the option dollar volume difference of ITM minus OTM options for stock j at time t, relative to the average of the same variable over the period $[t-60, t-6]$. $AbnNews(j,\tau)$ is the abnormal average of number of Ravenpack news related to stock j on $[t-5, t-1]$, minus the average on $[t-60, t-6]$. $Ret(j)_{[t-5,t-1]}$, and $Ret(j)_{[t-10,t-5]}$ is the average of return of stock j on the $[t-5, t-1]$ and $[t-10, t-5]$, respectively. Finally, $Vol(j)_{[t-10,t-1]}$ is the average of the historic volatility of stock j on $[t-10, t-1]$. α_s and α_t correspond to stock and day fixed effects, respectively. Newey-West corrected standard errors are clustered by stock and day, and are presented in parentheses. *, ** , and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The sample period is from January 1, 2014, to December 31, 2022.

A. Professionals

	Call options				Put options			
	1 to 7 days	7 to 30 days	30 to 90 days	90 days	1 to 7 days	7 to 30 days	30 to 90 days	90 days
$AbnPosts(\tau)$	0.0004***	0.0000	-0.0001***	-0.0002***	0.0003***	0.0002***	0.0000	-0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0000)
N	1,730,113	4,634,609	5,541,641	5,762,086	1,730,014	4,634,780	5,540,910	5,759,148
R^2(%)	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

B. Firms

	Call options				Put options			
	1 to 7 days	7 to 30 days	30 to 90 days	90 days	1 to 7 days	7 to 30 days	30 to 90 days	90 days
$AbnPosts(\tau)$	0.0003***	-0.0000	-0.0004***	-0.0006***	0.0009***	0.0005***	0.0001	-0.0001
	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
N	1,730,113	4,634,609	5,541,641	5,762,086	1,730,014	4,634,780	5,540,910	5,759,148
R^2(%)	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes