Gamma Mama! Could 0DTE Options be the Cause of the Next Market Meltdown

By Vineer Bhansali| March 03, 2023

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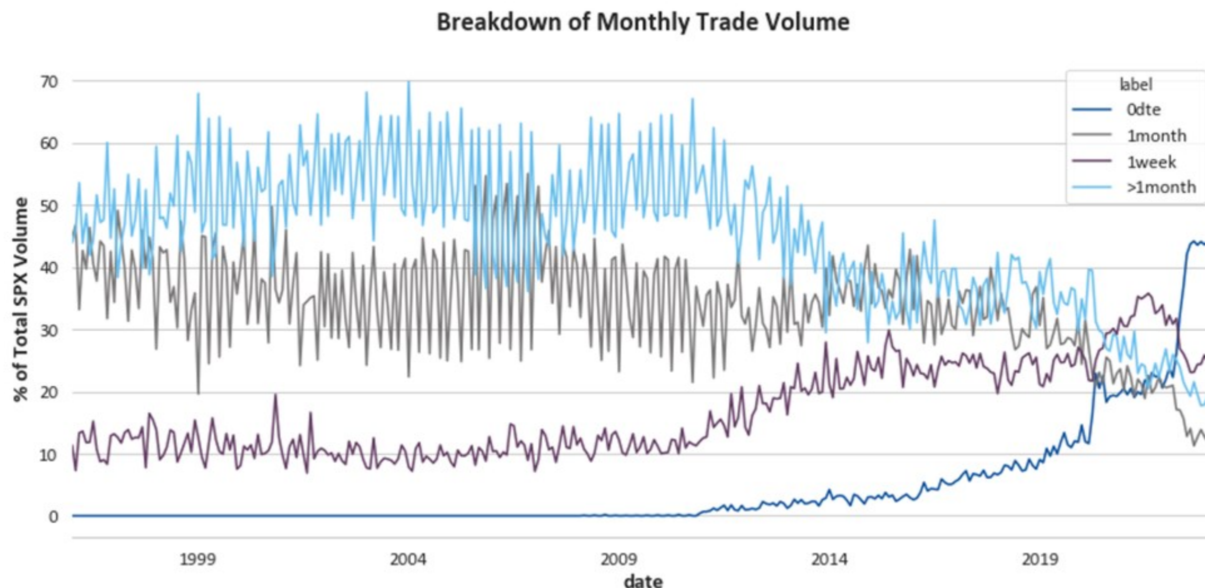
If the GameStop phenomenon of a couple of years ago did not convince us that options trading are the new opioid for the financial masses, what we are going to discuss today should. And it can influence your financial health! Having traded options across all assets for the last thirty years, my sixth sense is tuned to the subtle changes below the surface in the options trading ecosystem, and a new development in the options markets is worth paying close attention to. For this reason, "same day expiry (0DTE)" options have quickly become the topic of discussion amongst options cognoscenti and even the news media has picked up on this frenzy.

Wall Street and the trading exchanges cater to their consumers. Today's main consumers of financial products are retail traders, many of whom learnt basic option math watching YouTube videos and on Reddit, maybe in college. These same consumers also honed their amateur skills in day-trading during the COVID era. And finally, these traders know how to use network effects, i.e. social media, to influence the power of the masses, which, as we know can impact markets in unpredictable way, just as locust swarms do to fields (see here).

Index options on the S&P 500 now expire on every day of the week. So if you are a day trader of the S&P 500 or its ETF cousin the SPY, you can literally wake up in the morning and day trade, with immense leverage, an option that will expire at the end of the day. This strategy has no overnight margin risk since the options are "self-liquidating". As long as you have enough capital to buy or sell one of these options, you can. What has been stunning is that over 40% of all S&P-related options are now same day expiry (Source: Optionmetrics), or "zero -day-to-expiry" options, shorthanded as "0DTE". Ten years ago this number was about 5-10%.



Source: Optionmetrics, LongTail Alpha

So imagine that you have $100,000 for “trading”. You can very rationally take this money and open a retail brokerage account and deposit the cash into Treasury Bills, which are yielding about 5% for six-month expiry. So now, assuming 250 trading days a year, your trading budget, from the income, without touching the principal at all, is 2 basis points a day or $20 a day. Does not seem like a lot. But if you were to go and search what options you could buy with this premium, you would find that there are indeed option “lottery tickets” that you could afford with even such a small amount of money. As a matter of fact, as of the opening yesterday this morning (March 2, 2023), a 0.75% out of the money call option on the SPY cost only 20 dollars (Source: Bloomberg). If you traded only once every, say, 10 days, then your budget would be $200, and you could afford to buy 10 times the quantity of options of these same strikes, or move your strikes closer to at-the-money. Better yet, if you were a little late getting up today from too much partying last night, the same options would have decayed to half their value as you got closer to the expiration time in the afternoon, so you could do even more if you thought things were going to get interesting toward the close. If you and 20,000 of your social media friends all decide to do this at the same time, well, the impact on markets can be truly enormous.

Options close to their exercise price on the day of expiry are essentially what are called "binary" options. To price them, one would be foolish to use Black-Scholes. To hedge them using Black-Scholes, one would have to be suicidal. The easiest way to price binary options is to use the concept of "jumps". If the probability of a jump is p, and the magnitude of the jump is J, then the fair value of an at-the-money option should just be p times J (of course in reality the option will usually have a price higher than the fair value). The hedge ratio, i.e. how much of the underlying security one has to buy or sell flips changes massively at the strike and is essentially equal to the probability of finishing in the money. At expiry, you are sitting on a "knife's edge". At expiry, below the strike you need no hedge, and above the strike you need 100% of the underlying security (assuming you are hedging a call option). This, in option language, means that there is enormous (essentially infinite) gamma in the option at the strike, since the delta of the option can change from 0 to 100% for a miniscule move in the price of the underlying security.

"Large swings in the markets are here to stay for now as long as cash investment continues to yield more than long term assets and the yield on the cash can be used to speculate on financial assets via enormously levered strategies such as same day expiry options."

By the way, I asked ChatGPT whether 0DTE options are dangerous, and here is what it came back with (which is not bad at all):

"Yes, 0DTE (Zero-Day to Expiration) options can be very risky and dangerous. These are options contracts that expire on the same day they are purchased.

The danger with 0DTE options is that the price of the underlying asset can move quickly and unpredictably, especially on the day of expiration. This can result insignificant gains or losses, depending on the direction of the price movement.

Additionally, 0DTE options have a very short time frame, which can make it difficult to predict the direction of the underlying asset's price movement with any degree of certainty. This can lead to increased volatility and higher risks.

Furthermore, the bid-ask spread on 0DTE options tends to be much wider than for longer-term options, which can result in higher transaction costs and reduced liquidity.

Therefore, it is generally not recommended for novice traders to invest in 0DTE options unless they have a high risk tolerance and experience with options trading."

Let us do an example to make all of this concrete: The above mentioned 0.75% out of the money call option would expire in about six hours when I wrote this in the morning yesterday right at the open (the level of the SPY at the time was 393.8 and the strike was 397). The price of the call option was roughly $20, and the notional exposure to equities that this gives me was $39,380 (so a leverage of 2000 to 1!). The theoretical Black-Scholes "delta" of this option was about 13%, or in other words the effective intraday exposure to the SPY this option was 0.13*$39,380 or roughly $5,000 of equivalent equity exposure. This is what a "hedger", i.e. a dealer who is short the option would have to theoretically buy (assuming using Black-Scholes) to hedge their short position in the option. If the option expires out of the money, the dealer would keep the premium. On the other hand, if there was enough buying of this option (think social networks and WallStreetBets), the act of buying the hedge could propel the option towards the strike. If there was enough demand for the options, the need to hedge could easily overwhelm the liquidity of the market.

Flipping the example on its head, what if the speculation was on put options? This would obviously require the hedgers to sell short the underlying security. And if there was enough demand from the option community, the selling in itself could propel the market lower and propel more selling.

"But what we have to remember is that where there's outsized leverage and potential for quick gains, there's often trouble lurking right around the corner."

So where does this leave us?

As I wrote a few months before the implosion of the XIV debacle in 2018 (here), markets can easily get overwhelmed by the size of trading flows when they are programmatic, risk management driven, and in one direction. The recent rise on 0DTE options trading seems to be setting up the kindling for another event of similar magnitude. Large swings in the markets are here to stay for now as long as cash investment continues to yield more than long term assets and the yield on the cash can be used to speculate on financial assets via enormously levered strategies such as same day expiry options. Very rationally, yet again, retail investors are holding their assets in cash and speculating in the options markets, which provide both an easy fix, asymmetric risk-reward and massive leverage. But what we have to remember is that where there's outsized leverage and potential for quick gains, there's often trouble lurking right around the corner.

Important Disclosures

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