OPTIONS DEALER POSITIONING DASHBOARD

USER GUIDE

https://www.vol.land

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TABLE OF CONTENTS

ABOUT VOLLAND

Volland by Wizard of Ops is the only platform that accurately sheds light on option dealer positioning.

Since the goal of option dealers is to make the difference between bid and ask prices on option orders, they strive to minimize the positional risk in their book. Volland shows where the aggregate dealer positional book is most vulnerable. This allows you to anticipate market moves by identifying when dealers must buy or sell.

By using Volland, you can also gauge customer sentiment by identifying the aggregate customer position.

With nearly 1,000 individual equities, ETFs, and indices covered, Volland is an essential tool for all investors and traders to help forecast option market liquidity.

The Volland team is developing additional features for subscribers. These features will be described in future versions of this guide.

HOW TO ACCESS VOLLAND

Access to Volland requires an active subscription to a tier of the user's choice. All subscriptions are managed through https://www.vol.land.

Volland dashboard fees are charged through a subscription fee to a credit card that is automatically renewable every month through the Stripe subscription service available on http://www.vol.land.

Volland offers six different subscription plans to suit various trading needs. All subscriptions have access to the same update times (every 2 minutes) and core tickers of nearly 1,000 individual equities, indices, and ETFs. Additional tickers are available on select plans.

The subscription tiers are VolHacks, Volland Swing, Volland 0DTE, Volland Insight, Volland Universe, and Volland Institutional.

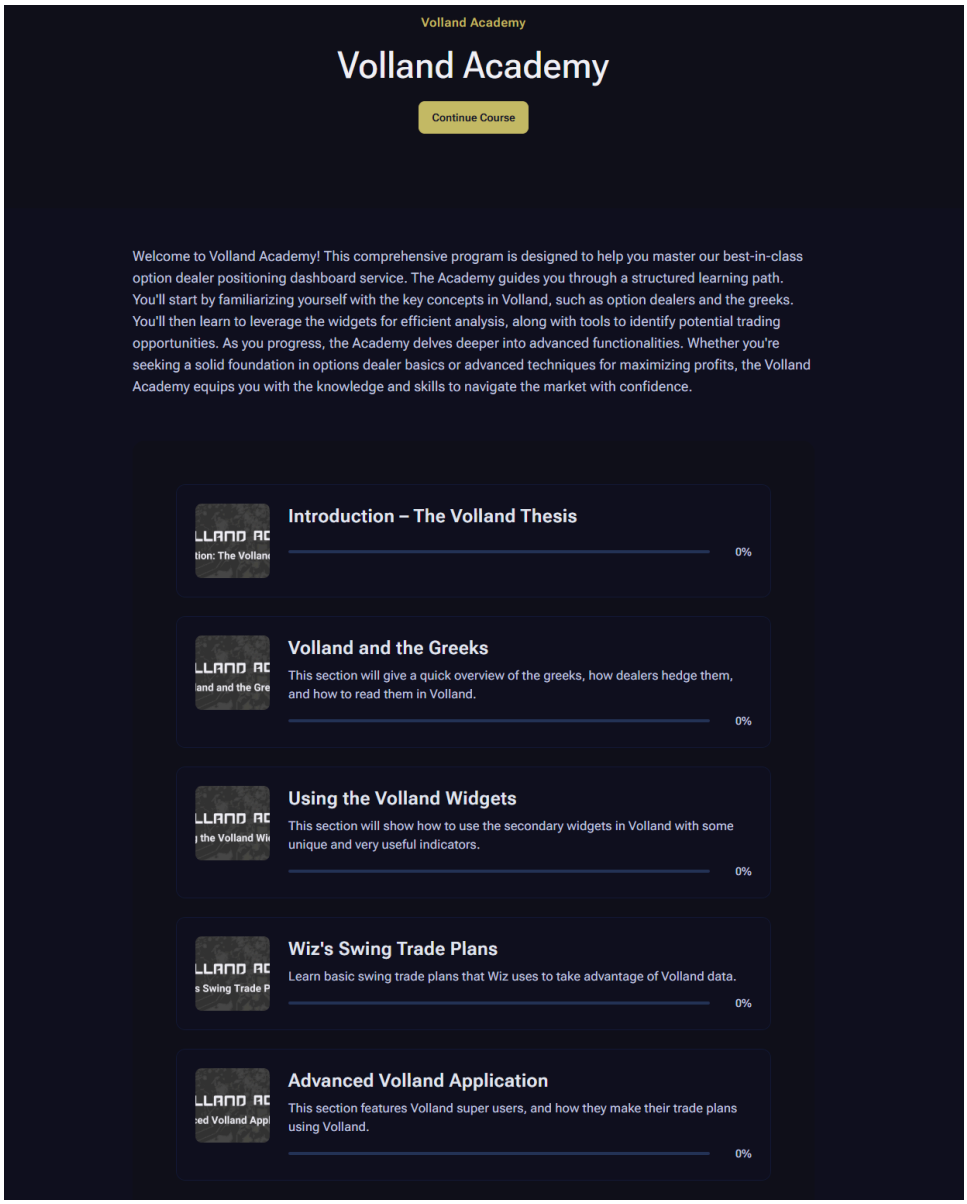
Subscribers may cancel, upgrade, or downgrade their subscription directly on the Volland website or by emailing a request to info@addeumfunds.com.

VOLLAND ACADEMY

Volland offers a self-directed e-learning platform to help users to master our best-in-class option dealer positioning dashboard service. The Volland Academy is available at https://vol.land/academy.

The Academy's modules guide users through topics of their interest, complete with instructional videos and quizzes to test their knowledge. Users are not required to follow the course in order. New modules are added periodically to the Academy.

Learning with the Volland Academy requires an account on Volland's site, but access is free.

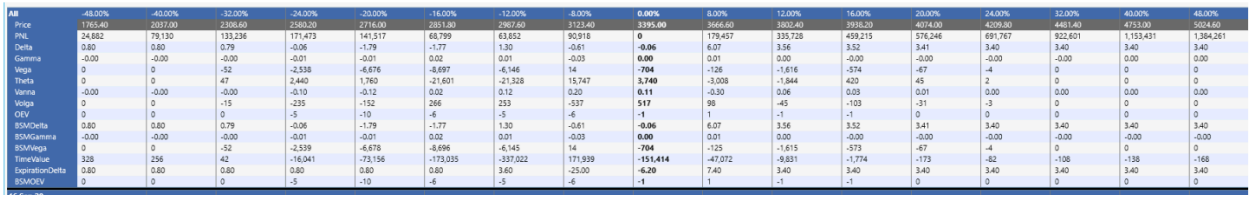


THE BASICS

Who are Dealers?

When an option order is received, a middle man, called an “options dealer”, “options market maker”, or “options wholesaler”, is financially incentivized to accept the order. These entities (individuals, firms, etc.) provide essential liquidity for markets to function.

Because dealers are exposed to adverse selection, they are motivated to hedge their risk. In fact, at the end of every day, this form used to be filled out by the risk manager for each market maker. If any of the categories fell outside an acceptable threshold, the dealer is warned the first time, and fired after their second violation. If fired for this reason, they would not be hired by another dealer firm.



All	-48.00%	-40.00%	-32.00%	-24.00%	-20.00%	-16.00%	-12.00%	-8.00%	0.00%	8.00%	12.00%	16.00%	20.00%	24.00%	32.00%	40.00%	48.00%
Price	1765.40	2037.00	2308.60	2580.20	2716.00	2851.80	2967.60	3123.40	3395.00	3666.60	3802.40	3938.20	4074.00	4209.80	4481.40	4753.00	5024.60
PNL	24,682	79,130	133,236	171,473	141,517	68,799	63,852	90,918	0	179,457	335,728	459,215	576,246	691,767	922,601	1,153,431	1,384,261
Delta	0.80	0.80	0.79	-0.06	-1.79	-1.77	1.30	-0.61	-0.06	6.07	3.56	3.52	3.41	3.40	3.40	3.40	3.40
Gamma	-0.00	-0.00	-0.00	-0.01	-0.01	0.02	0.01	-0.03	0.00	0.01	0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00
Vega	0	0	-52	-2,538	-6,676	-8,697	-6,146	14	-704	-126	-1,616	-574	-67	-4	0	0	0
Theta	0	0	47	2,440	1,760	-21,601	-21,328	15,747	3,740	-3,008	-1,844	420	45	2	0	0	0
Vanna	-0.00	-0.00	-0.00	-0.10	-0.12	0.02	0.12	0.20	0.11	-0.30	0.06	0.03	0.01	0.00	0.00	0.00	0.00
Volga	0	0	-15	-235	-152	266	253	-537	517	98	-45	-103	-31	-3	0	0	0
OEV	0	0	0	-5	-10	-6	-5	-6	-1	1	-1	-1	0	0	0	0	0
BSMDelta	0.80	0.80	0.79	-0.06	-1.79	-1.77	1.30	-0.61	-0.06	6.07	3.56	3.52	3.41	3.40	3.40	3.40	3.40
BSMGamma	-0.00	-0.00	-0.00	-0.01	-0.01	0.02	0.01	-0.03	0.00	0.01	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
BSMVega	0	0	-52	-2,539	-6,678	-8,696	-6,145	14	-704	-125	-1,615	-573	-67	-4	0	0	0
TimeValue	328	256	42	-16,041	-73,156	-173,035	-337,022	171,939	-151,414	-47,072	-9,831	-1,774	-173	-82	-108	-138	-168
ExpirationDelta	0.80	0.80	0.80	0.80	0.80	0.80	3.60	-25.00	-6.20	7.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
BSMOEV	0	0	0	-5	-10	-6	-5	-6	-1	1	-1	-1	0	0	0	0	0

Nowadays there are only a few wholesaling companies led by Citadel who handle a large portion of option orders. Currently, most market making is done through algorithms and computers, and physical trades at an exchange are primarily reserved for large and complex orders. It is estimated by Cboe that 85-90% of all option orders are accepted by option dealers.

How Do Dealers Operate?

Dealers have four main ways to alleviate their risk.

1. Their first and most preferred choice is to find a willing customer on the other side of the trade to whom they can hand off the contract. This creates guaranteed income with no risk for the dealer.

2. The second choice is to hedge with other customer option orders that reduce the overall greeks in the book.

3. The third choice is to hedge with the underlying stock through delta hedging.

4. The fourth choice is to hedge with associated or correlated products, for instance hedging SPX options with a basket of stocks meant to mimic the index. This is called dispersion, and has grown in popularity.

What Portion of Market Moves is Option Liquidity?

As shown in numerous academic papers, option liquidity and gamma hedging account for roughly *one third* of underlying trades in equities! It is estimated to be the largest institutional source of equity flow in the market today at any given time. This can be measured through the spot-vol correlation of determination (R^2) on each underlying equity in the spot-vol correlation widget.

How Does Volland Measure Option Dealer Positioning?

Volland uses a real-time option trade execution feed through the Option Pricing Regulatory Authority (OPRA) sourced through Cboe to identify every option trade executed. On an option order-by-order basis using executed price, execution IV, binomial fair value, and bid/ask spreads as a guide, Volland determines if each order filled is a buy or a write on the dealer side.

For each transaction, Volland calculates the greeks that represent the risk the dealer is assuming.

For each strike at each expiration, Volland compiles the total dealer positioning.

For the exposure widgets, Volland calculates how much of each greek exposure the dealers would have at each strike. This is relevant to determine the hedging momentum for each greek.

THE GREEKS

The greeks are measurements of the four main variables in options: security price, implied volatility, interest rates, and time.

Volland's main value is in tracking greeks for various tickers at different expirations and for puts, calls, and both.

Delta shows how much profit you can expect with a $1 increase in the underlying stock price. This greek is also interpreted as the percent chance the option ends "in the money". Delta represents how many shares of the underlying the dealers need to fully hedge their position at any given moment. Dealer total delta is assumed to be hedged before the end of the day. This is because this is the immediate risk that dealers assume when they accept an options position. Delta values across the option chain give an expected distribution of returns from the current moment to expiration.

Gamma is the sensitivity of delta to movements in the underlying price. Dealer gamma positioning is inversely correlated to standard deviations of realized volatility. In other words, as dealer gamma exposure decreases, volatility increases. It is helpful to know this data on a strike-by-strike basis to know how the market will act as it approaches each strike. The higher magnitude of gamma at each strike, the more that strike can act as an accelerant or support/resistance to the underlying market. A large positive gamma bar would act as support or resistance while large negative gamma bars would act as accelerant. Our data suggests that gamma is not the primary greek that moves markets, but it is still helpful to know the gamma impact of hedging.

Delta-Adjusted Gamma (DAG) helps us see in one view if dealers would need to strongly buy or sell the underlying at those strikes due to gamma. This is because gamma itself does not give hints on what direction that strong move can happen. The calculation of DAG is to flip the sign of all strikes higher than the current price. Therefore, when you see a green bar, in DAG on the exposure widget, it represents dealer buying while red DAG represents dealer selling. The purpose of DAG is to be able to visualize bullish and bearish dealer hedging sentiment on the cumulative chart easier.

Vanna is the sensitivity of deltas to changes in implied volatility. It can also be interpreted as changes to vega, based on movements in the underlying. To be more precise, vanna measures the change in deltas for every 1-point change in annualized implied volatility on that particular option (fixed price volatility).

Dealer vanna positioning is inversely correlated to market trend. In other words, if total dealer notional vanna is positive, the market trend will be negative as long as implied volatility is increasing, and vice versa. On an individual strike basis, positive vanna will act as a magnet while negative vanna will act as a repellent assuming implied volatility is acting in accordance with its spot-vol correlation.
One quality of vanna that makes it unique is that the exposure is positive or negative based on its position to current price. For instance, an out-of-the-money put has negative vanna, because as implied volatility decreases, its delta increases and trends from negative delta towards 0, but

if that same put is in-the-money, it will trend towards -1 delta instead of 0, so the vanna is positive because as implied volatility decreases, the delta of that option also decreases. Vanna has a larger impact when implied volatility is high because implied volatility has more fluctuations when it is high.

Total dealer vanna is a measure of skew. Since Volland shows the aggregate dealer book, vanna exposure shows how much underlying movement changes the overall vega positioning, which has a profound impact on markets. When vanna is at its maximum, the natural, slow reduction in IV causes a bullish drift that correlates with existing option positioning and aggregate vanna. Vanna can be viewed as the conversion rate of vega to delta.

In short, in normal term structures where near-term implied volatility is lower than longer-term (contango), positive vanna is a bullish force. Negative vanna would create a choppy bearish force when the vega of the position is realized as a deviation from the typical distribution of market returns.

Charm is the sensitivity of deltas to the passage of time. Cumulative dealer charm positioning will help determine the daily bias in the markets. Time to expiration is always decreasing, and the exponential portion of it is accounted for in the actual measurement. Due to the changing value of each day as we approach expiration, charm is the most volatile indicator in Volland as an option approaches expiration.

Like vanna, charm exposure is positive or negative based on its position to current price. However, because we calculate it as the passage of time (+1 day passing), it is the opposite sign of vanna on each strike. Charm cooperates with vanna when IV is decreasing. It never cooperates with vanna when IV is increasing. Both vanna and charm calculate the effect the option premium has to deltas.

Because of its proximity to expiration, “0DTE” (options that expire at the close of regular trading hours that day) option hedging and projected movement primarily uses charm as its driving greek.

Vega measures how much profit is made on the options position based on a one-point increase in annualized implied volatility. Dealer vega is not necessarily immediately hedged, as market makers have a wider risk acceptance for vega than for delta. To an extent, vega risk is assumed to have realized gains through mean reversion, but it can also be the first indication of dealer stress. We assume 30-40% of vega is hedged, but vega can be a source of liquidity strain to dealers and can cause “vol events”.

The Volland white paper, “Impact of option dealer flows on equity returns”, shows a strong correlation between vega hedging and market movement. The correlation is very similar to the inverse slope of the current spot-vol correlation, which is the inverse correlation between spot price and VIX. As a result, we believe spot-vol correlation (and therefore skew) is determined by aggregate dealer vega positioning. The changes in vega (and therefore IV) is determined by vanna (as it relates to the underlying) and vomma (which is second order vega).

Theta measures how much profit is made on the options position based on the passage of a single day. Dealer theta represents how much dealers are making or losing due to the passage

of time. When dealers hold positive gamma, typically theta is negative and vice versa, so it is commonly said that theta is the price of gamma.

Vega and theta are the first order “premium greeks” because they are measured by changes in the premium of the option, either from time decay (theta) or implied volatility changes (vega). Combined, understanding the total premium exposure of the dealers is critical in knowing their current liquidity. If dealers are holding a lot of premium, they will have a lot more liquidity and appetite for risk. If they are neutral or negative premium, they would need to hedge a lot more often to make money through volatility, and as a result realized volatility will increase.

Vomma is the sensitivity of vega to movements in implied volatility. Dealer vomma is like the “gamma of vega”. Since dealers do not strictly hedge their vega, vomma is a more accurate measure of a dealer’s portfolio risk than gamma. Vanna represents the skew of the option chain, but vomma represents the rate of change of skew expected. Therefore, vomma is meant to account for the rate IV increases along the vol curve in each tenor.

COMMONLY USED ACRONYMS

These acronyms are specific to the Volland options dealer positioning platform and/or are commonly referenced by Volland users.

0DTE: Zero days until expiration. Options that expire that same day.
1DTE, 2DTE, etc.: One day until expiration, two days until expiration, etc. Options that expire in one day, two days, etc.
AH: After hours
AMC: After market close
ATM: At the money
BD: Broker-dealer
BMO: Before market open
BTC: Buy to close
BTD: Buy the dip
BTO: Buy to open
Cboe: Chicago Board of Options Exchange
CME: Chicago Mercantile Exchange
CPI: Consumer Price Index
CTA: Commodity trading advisor
DAG: Delta-adjusted gamma
EOD: End of the day
/ES: E-mini S&P 500 Index Futures
ETF: Exchange-traded fund
FOMC: Federal Open Market Committee
GTC: Good-til-canceled
HOD: High of the day
HV: Historical volatility
ITM: In the money
IV: Implied volatility
LIS: Line in the sand
LOD: Low of the day
MM: Market maker
MOpEx: Monthly options expiration
OpEx: Options expiration
OPRA: Option Pricing Regulatory Authority
OTM: Out of the money
PnL: Profits and losses
RTH: Regular trading hours
RV: Realized volatility
SPX: Standard & Poor’s (S&P) 500 Index
SPY: SPDR S&P500 ETF
STC: Sell to close
STD: Standard deviation
STO: Sell to open
SVC: Spot-vol correlation
VIX: CBOE Volatility Index
VWAP: Volume-weighted average price
/VX: CBOE VIX Index Futures

COMMONLY USED TERMINOLOGY

This terminology list is specific to the Volland options dealer positioning platform and/or is commonly referenced by Volland users.

For common terminology in the options trading world, please visit the Glossary published by The Options Institute powered by Cboe.

For common terminology in the futures trading world, please visit the Glossary published by CME Group.

Dealer o'clock: Options market makers must end the day hedged. At approximately 1:30-3:00 p.m. Eastern, dealers begin to aggressively hedge their book.

Line in the sand (LIS): The strike at which dealers change their behavior – either from buying to selling, or selling to buying. The line in the sand typically is defended as the soft deltas from vanna start to indicate fading the move towards the line in the sand is prudent. If that price level is broken, dealers start to gamma hedge, and the trend continues at a more aggressive pace.

Magnet: The strike that price will be attracted to, usually in reference to positive vanna strikes.

Overvixed: There is a clear correlation between the VIX and percent change in SPX. Overvixing – overstatement of VIX – is when VIX runs higher than the SPX change implies.

Paradigms: Because of a 0DTE principle which states ***dealers tend to trade options to become risk neutral in aggregate vanna and charm***, you will find that 0DTE charts are frequently uniform in nature. There are few occurrences where the charts are staggered. At different times in specific conditions, customer behavior can fall into one of four paradigms.

- **Bank of America (BofA) Paradigm**: In a paper by BofA, they stated their belief that customers are long calls and puts on 0DTE.
- **Sidial Paradigm**: In a paper by Kris Sidial, he stated his belief that customers are short calls and puts on 0DTE.
- **GEX Paradigm**: First written in a paper by SqueezeMetrics, this "gamma exposure" paradigm is when customers are long puts and short calls.
- **Anti-GEX (AG) Paradigm**: The opposite of GEX, this paradigm is when customers are short puts and long calls.

Rolling calls: Changing a call position to either a higher strike or further out in time.

Skew: The rate of change of implied volatility on an option chain. Vertical skew refers to the implied volatility change within an expiration from one strike to another. Horizontal skew refers to implied volatility change at a fixed strike over different expirations.

Spot: Current price of the underlying.

Spot-vol correlation (SVC): The linear regression between VIX points and percent change in SPX on a daily timeframe.

Strike: The relevant price on an option contract.

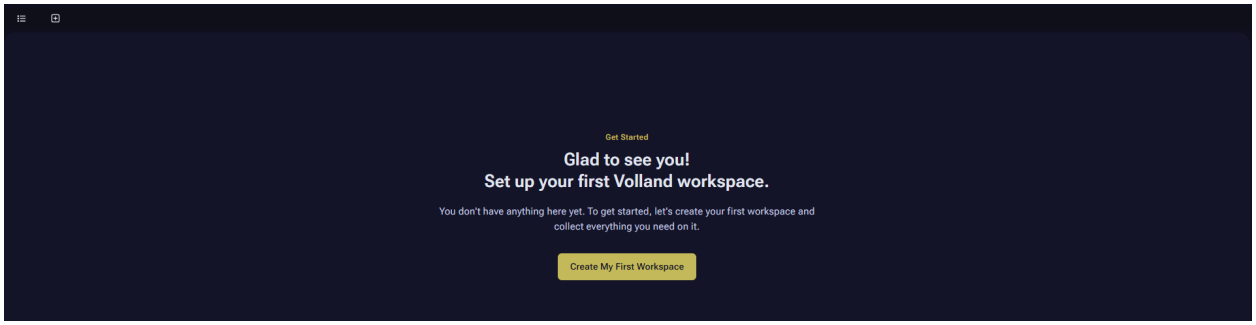
Tenor: Tenors are the different expirations for options. For instance, 0DTE is a tenor as is 30DTE.

Undervixed: There is a clear correlation between the VIX and percent change in SPX. Undervixing – understatement of VIX – is when VIX runs lower than the SPX change implies.

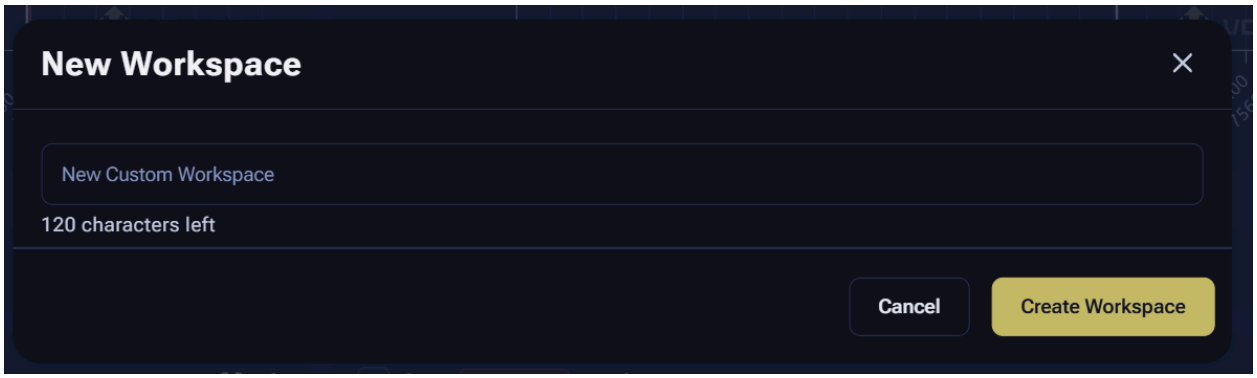
Vol: Volatility, typically implied volatility.

OPERATIONAL INSTRUCTIONS

Volland's user interface allows users to build custom workspaces to see their preferred metrics in a single, concise screen.

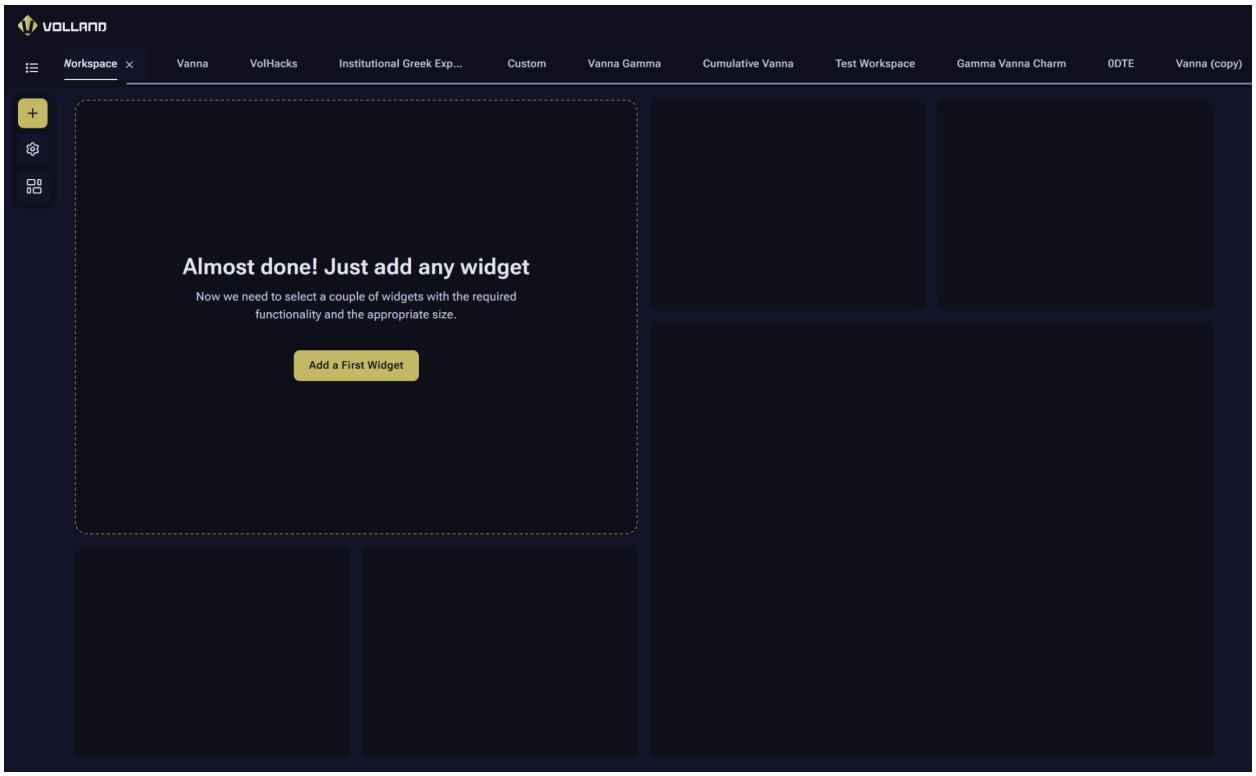


After subscribing and logging in, you will see a welcome screen. Click on "**Create My First Workspace**". You will give each workspace that you create its own unique title, which will appear as a tab at the top of the page.



Later on, you can click on the plus ("**+**") at the top left of your screen to make other workspaces.

Each workspace is a compilation of widgets. There is no limit to how many widgets you can have on a single workspace. If your workspace has more widgets than can fit on a single screen, you will be able to scroll in your workspace to see the widgets you add.



When you set up your custom workspace, you will have a choice between many widgets. Widget availability varies by tier. When your blank workspace appears, click on "**Add a First Widget**" to add a widget or click on the yellow plus (**+**) box to the left of the workspace to add more widgets. These widgets will be further explained in this guide, including what each dropdown menu means.

FRAMEWORK AND USE CASES

INTERPRETING THE GREEKS ON VOLLAND

This entire chart should be seen from the perspective of *dealers*. For example, DAG – positive above spot – *dealers will be* buying.

	Positive (+) Above Spot ⬆	**Positive (+) Below Spot ⬇**	**Negative (-) Above Spot ⬆**	**Negative (-) Below Spot ⬇**
Charm	Bearish	Bearish	Bullish	Bullish
Delta	Dealer long calls or short puts	Dealer long calls or short puts	Dealer short calls or long puts	Dealer short calls or long puts
Gamma	Resistance	Support	Permissive	Permissive
Delta-Adjusted Gamma (DAG)	Buying	Buying	Selling	Selling
Theta	Short options	Short options	Long options	Long options
Vanna	Magnet	Magnet	Repellent	Repellent
Vega	Short Premium	Short Premium	Long Premium	Long Premium

Notes:
Charm – Aggregate charm combined with net dealer premium is what matters (not the strikes, except to see how strong charm is as price moves or to determine when charm will flip sign).
Delta – When looking at Volland, I assume all current delta is hedged.
Vanna – This assumes IV is negatively correlated with spot price. When considering the bullishness or bearishness of vanna, aggregate vanna is the key. The more positive aggregate vanna is, the more bullish the outlook.
Vega – Vega is typically a risk mostly warehoused by dealers, but can cause liquidity issues at extremes.

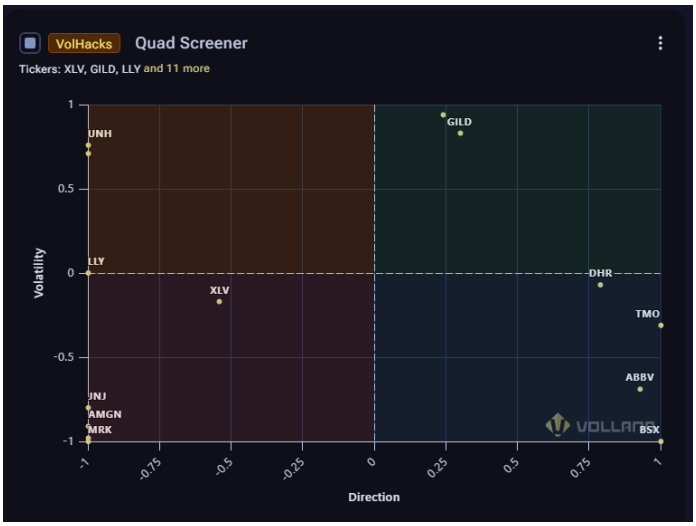
THE WIDGETS

Volland organizes its data into dynamic widgets that its users build into workspaces.

VolHacks

The VolHacks widgets are designed to simplify the edge that Volland provides. Since they are designed around simplification, we recommend using them prudently, and still learning the impacts of Volland data in a more granular way to make better trade plans. As you learn, VolHacks will help you make effective trades. The following are descriptions of the VolHack widgets.

Quad Screener

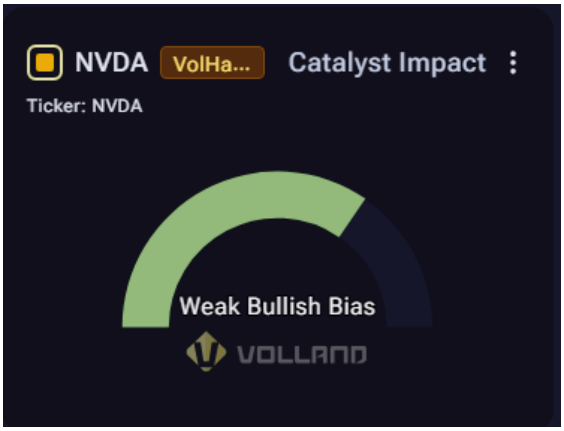


The Quad Screener allows the user to select a variety of stocks, indices, and ETFs from Volland's library of approximately 1,000 tickers and see how dealer positioning will impact their flows.

The X-axis uses vanna exposure to determine the directional lean for the stock compared to the past 6 months. The Y-axis uses gamma exposure to form volatility expectations.

Here are two examples of use cases. First, users can create a workspace with many quad screeners for sector-specific analysis. This could show opportunities for dispersion trades, which gives portfolios a unique ability to control risk. Second, users can create quad screeners with an index, all of its leveraged ETFs, volatility ETNs, and large components to see if dealers are leaning too strongly in one direction or are overleveraged in a particular volatility regime.

Catalyst Impact

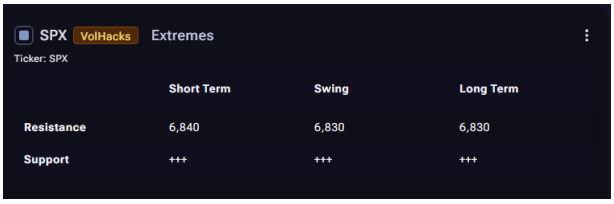


Have you ever had a fundamental thesis about a catalyst that was correct, but the market traded in the opposite direction? Have you ever wondered if a certain trade was too crowded? Have you ever been baffled about a stock's reaction to earnings?

The Catalyst Impact gauge shows the imbalance of price power based on delta change on the dealer book. It reveals what the influence of dealer hedging will have on the underlying stock based on the reduction of implied volatility that always happens after a catalyst.

A "strong bullish bias" indicates customers are positioned bearish on the margin, and the most likely direction of the underlying after a catalyst will be to the upside. This is not a fundamental thesis, but rather shows the imbalance of all the participants' positioning based on their fundamental theses. If your fundamental thesis is against the catalyst impact gauge, you know to stay out of the stock during the catalyst. If your thesis agrees with the catalyst impact gauge, you know that you have a contrarian position and should thoroughly research that position. If confirmed, you may wish to trade that catalyst. You will be shocked at how this widget demystifies post-catalyst price action.

Extremes



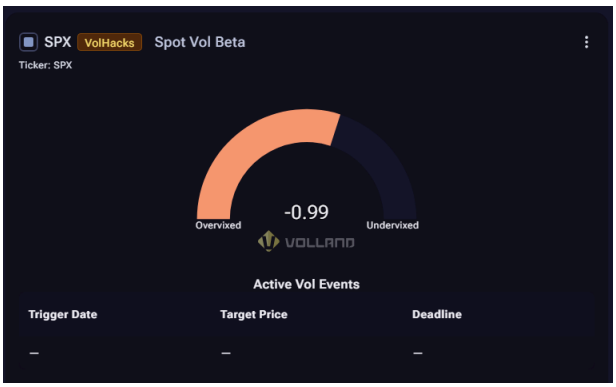
The extremes widget shows what price levels dealers would be actively working against market momentum. This is achieved through vanna transition levels on 3 different timeframes: Short-Term (0-2 weeks), Swing Term (2-6 weeks), and Long Term (2-6 months). These price levels represent areas where dealers are getting stretched and would be good prices to start looking for reversals.

If you see a "---" in the support extreme or a "+++" in the resistance extreme, that means there is not enough option volume at any price to stop market momentum based on vanna at that tenor.

If you see a "+++" in the support extreme or a "---" in the resistance extreme, that means the current price has passed the closest extreme and you should start to look for a reversal.

The Extremes widget uses three different tenors of vanna, and each tenor is not taking any other tenor into account. As a result, there is a possibility that a long-term resistance can be a lower level than a short-term resistance. It is important to isolate these price levels because vanna is calculated on fixed-price volatility, and volatility changes at a different pace at each tenor. Short-term extremes can be the strongest in calm markets; swing term can be the strongest in moderately volatile markets, and long-term tenors are the strongest force in very volatile markets.

Spot Vol Beta



From an academic standpoint, one of the strongest relationships in the market is the inverse correlation between daily changes in equity prices and the implied volatility of the underlying. A simple measurement of implied volatility is Cboe's VIX calculation. This relationship proves that option dealers have a strong impact on markets, and is known as the spot-vol correlation.

The Volland team completed a study of what happens when VIX overshoots its implied change in a day (what we call "overvixing"). We found when this happens, it mean reverts and guides SPX with it. In quantitative terms, whenever VIX changes 2 or more points when the day ends, SPX will trade at the prior day's close level within 3 weeks. Since 2012, this signal has succeeded 28 out of 30 times, giving a remarkable 93% success rate that options imply should only have on average a 42% success rate.

This popular quantitative edge is tracked in the Spot Vol Beta gauge. We call these instances "Vol Events" and track them in the table below the gauge.

Frequent overvixing tends to charge for a rally when markets reverse to the upside, and undervixing (when VIX undershoots its implied change in a day) helps time a top of a volatility-related rally.

Exposure Widgets

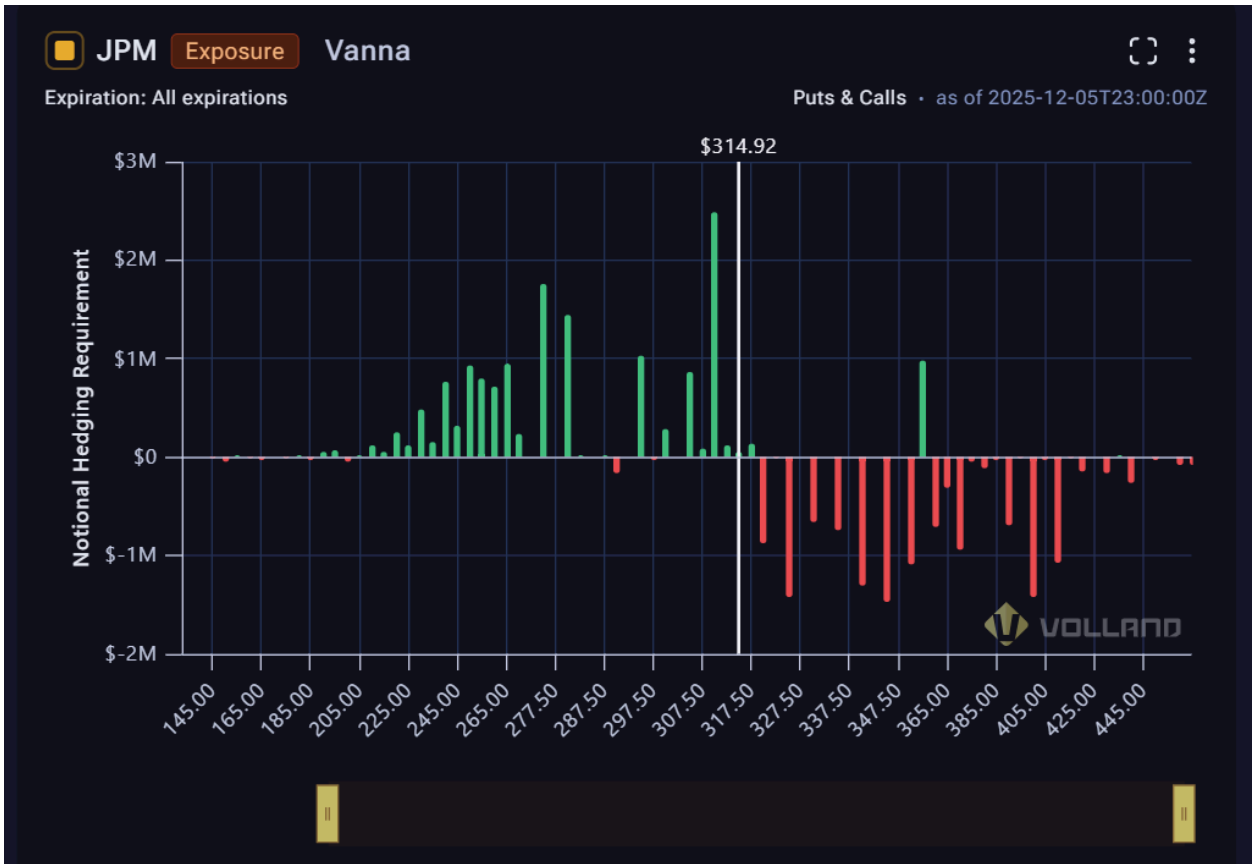
The purpose of the exposure widgets is to identify critical levels where dealers need to strongly buy or sell the underlying to hedge their deltas.

Volland categorizes every single option trade as dealer-bought or -sold and calculates all of the greeks on each trade. It then accumulates them to give you the greek values you see in the exposure widget. The exposure widget acts as a net dealer positioning histogram organized by strike.

The exposure widgets have a menu that allows you to first select your greek, then your ticker, expirations, and kind (puts, calls, or puts & calls).

The exposure widget setup has two parts which you can add simultaneously by clicking the toggle above the preview display.

The Exposure Chart



- The x-axis represents the option strikes available.
- The y-axis represents notional dollars dealers need to hedge (USD).
- Each bar represents how much notional dealers are holding for that greek at that strike. Hover over each bar for the strike and the notional hedging requirement.

The Dealer Flow Chart (“Cumulative Chart”)

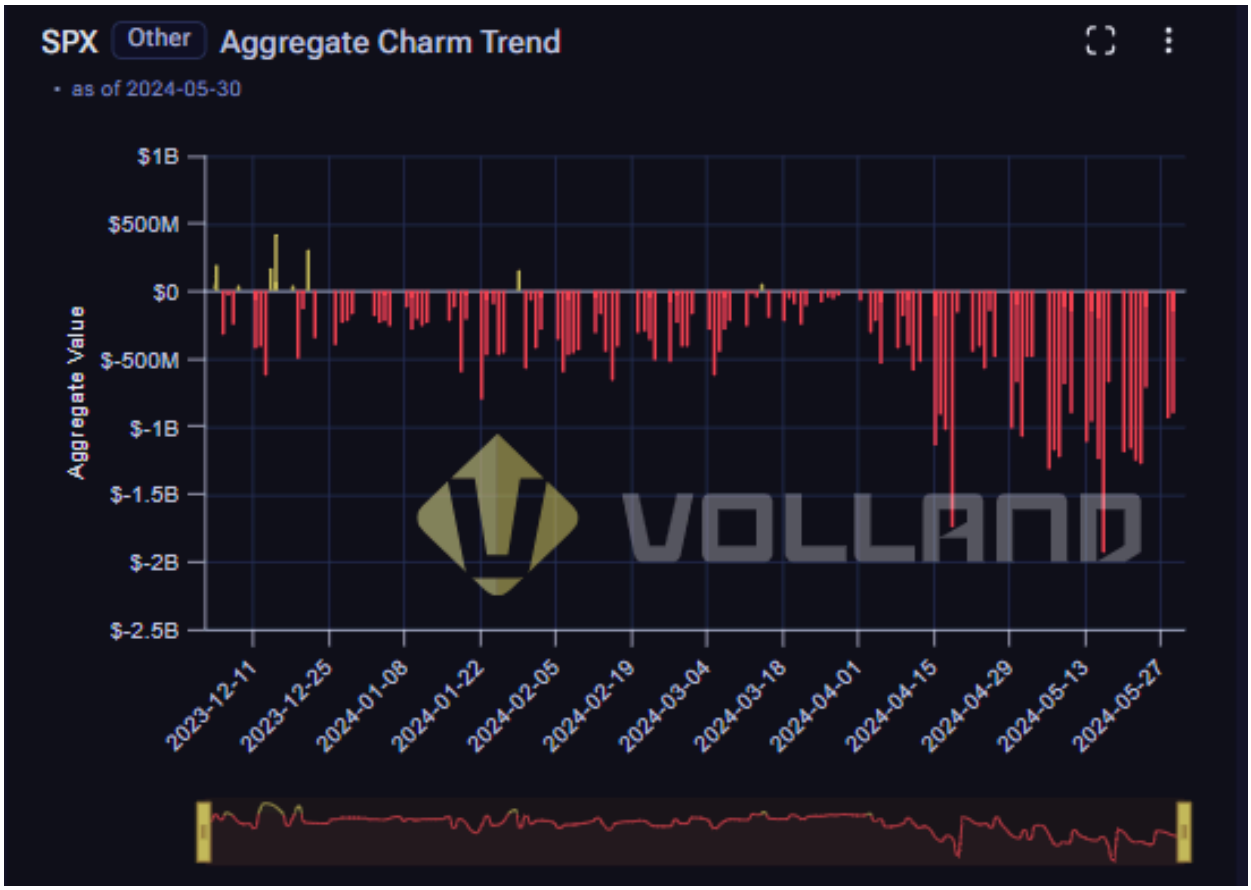
- The x-axis represents the option strikes available.
- The y-axis represents the cumulative dealer notional hedging requirement (USD).
- The chart will be different for each greek.
    - First-order greeks: absolute value of the dealer position in that greek across all strikes. (It will look like a horizontal line.)
    - Second-order greeks: closing strike at the most recent update is represented as zero, and as the market moves, the cumulative hedging requirements for that greek are shown. (It will look similar to the chart above.)

Historical Greek Charts

The purpose of the historical greek charts is to show how the current cumulative greeks compare to the most recent 6 months of historical cumulative greeks.

This is used as a guide for recent history and will help you determine how option dealers are positioned differently than they have been recently.

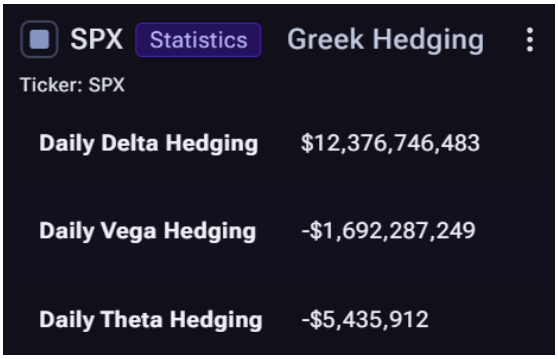
You can view the charts for any of Volland's tickers to get their profiles. To do so, under the "Statistics" widgets, select "Aggregate Greek Trend". You can then select your ticker and the greek to see the historical aggregate trend.



- The x-axis represents the daily time series going back 6 months.
- The y-axis represents the aggregate level of that greek on each day.
- In the example chart above for SPX, charm is very low compared to the prior 6 months, which means bullish delta decay is higher than it has been.

Greek Hedging Widget

The purpose of the greek hedging widget is to consolidate all of the calculations on change in notional volume due to vanna, gamma, delta, and charm on the existing dealer greek positioning. This widget simplifies those calculations into one total number that indicates buying or selling pressure on the stock itself. This number is a notional number, so it shouldn't be taken literally, but used as a comparison to the notional value that is traded in equities, which is in the statistics widgets selection.



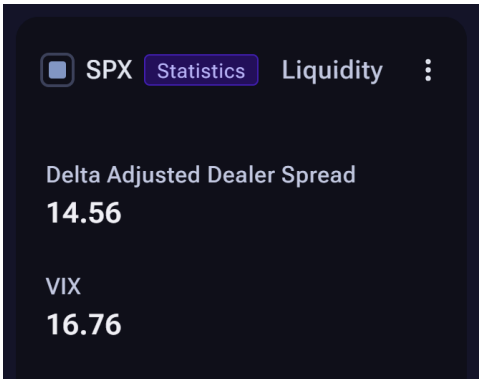
In the statistics section of the widget selection, you will see "Greek Hedging". When you open it, you will see the notional changes in delta, vega, and theta from the day before.

The delta hedging dollar amount is the total delta changes from new positioning, vanna, gamma, and charm all combined into a single number. *That means the daily delta hedging number is the total notional impact dealers had on the underlying that day.* It doesn't mean that is the amount the dealers have left to hedge since a lot of their hedging can be done throughout the day, but that number is vitally important.

The vega and theta hedging dollar amount is the amount of the premium greeks the dealers have changed over the day. These numbers combined should be reflected in IV and skew. If this number is negative, IV and skew should have dropped. If this number is positive, IV and skew should have risen.

Liquidity Widget

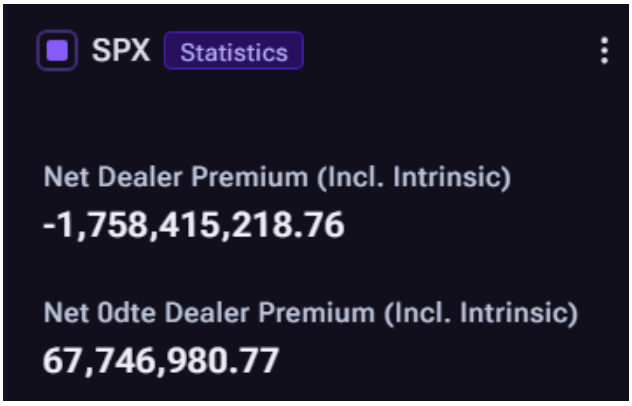
The liquidity widget is a Volland-exclusive calculation based on dealer execution quality. Delta-Adjusted Dealer Spread (DADS) shows the delta-adjusted edge that dealers are capturing every single trade. Volland takes the difference between the execution price and the fair value and multiplies that by the delta of the option. Volland then takes the average of the trade-level DADS and displays it in this liquidity widget.



When an option expires, the trade DADS is taken out of the equation. The more volatile the underlying is, the larger the DADS will be. DADS also correlates to VIX, which is shown underneath the DADS number. In a highly liquid environment, DADS is roughly 10-12 for SPX.

Net Dealer Premium Widget

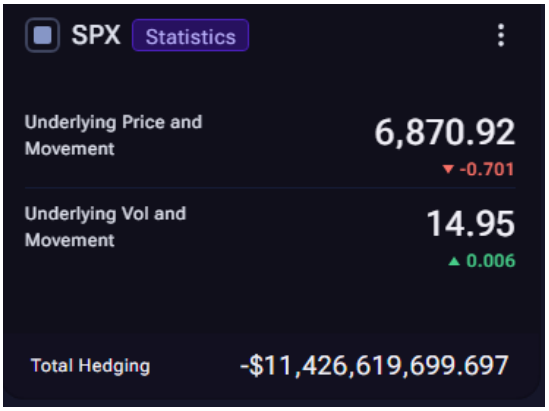
The net dealer premium widget adds some color to the current day's trading. How much are dealers collecting or disseminating for that day? The net dealer premium is showing the total amount of dealer premium for all open options traded that day, while the 0DTE premium shows how much of that premium is being collected exclusively in 0DTE options.



This is not a profit/loss for dealers, but should be compared with a rough estimate of how much payout will be required. This widget adds context to what you see in any trade.

Ticker Widget

The total hedging can be found on the "ticker" statistic widget along with the current price and the 30-day "VIX" calculation for that underlying.

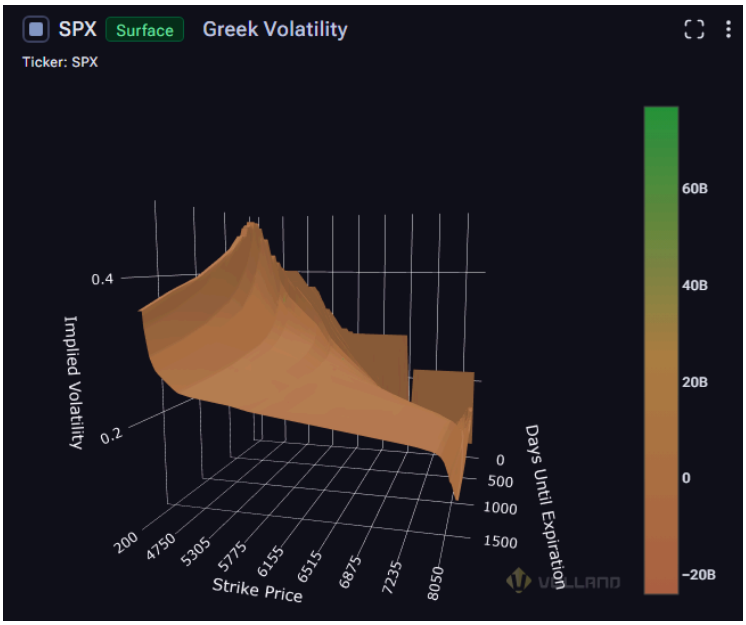


Much of the hedging in that total is warehoused by dealers, so when you see notional dealer hedging higher than equity notional traded, it doesn't mean that dealers are accounting for all the volume in the underlying equity. It means that the dealers have a lot of warehoused risk in that name, and volatile moves can affect that stock's price strongly. This is shown by how much technology names with high valuations can move in a single day.

For instance, AAPL, NVDA, TSLA, and META are multi-trillion dollar companies in market capitalization as of the writing of this guide, but earnings can move the stock 10-15% in one day.

The IV represented in the middle box is the VIX calculation of that ticker, **which means that Volland users have the VIX calculation of every single ticker that Volland offers**.

3D Volatility Plane

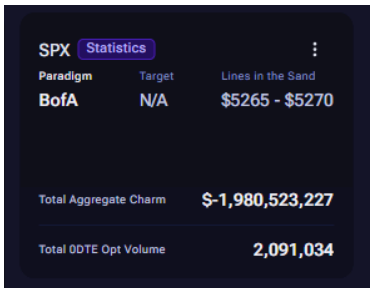


Volland has a widget showing a 3D vol plane. It shows the fixed price volatility for all strikes and all tenors as well as the changes in IV at the same time. Additionally, it is heatmapped showing where in the vol curve dealers have exposure to all the greeks as selected by you. It shows the change from yesterday's greek profile and the absolute greek profile. This is important because it shows exactly how much IV is left in each tenor, and how much positioning is changing to account for this activity. This gives context to the dealer book and the trading related to it.

In this view, there are three axes. The days until expiration is the x-axis, the strike price is the y-axis, and the implied volatility level is the z-axis. The colors show the absolute or relative (to yesterday) greek value using the key to the right. You may rotate the graph by clicking on the chart and turning it. You can also zoom in on the chart using the scroll wheel on your mouse. If you put your mouse pointer on the chart, you will see a tooltip showing the fixed-price vol, strike, and days until expiration of the option you selected.

The volatility plane is available for all of Volland's tickers, and it is very helpful particularly for planning options trades.

0DTE



Volland's 0DTE widgets are designed for intraday traders. They are available on the Volland 0DTE, Volland Universe, and Volland Institutional subscription plans.

0DTE Analysis Framework

These are the core principles and assumptions underlying this framework. These principles are realistic and have shown to be true with our own observations and discussions with MMs. Under these principles will be their rationale.

Principle #1:
Dealers need to be fully hedged by the end of the day, including in 0DTE.
In the old days, dealers had to hedge all their 1st- and 2nd-order greeks within a range and fill out a form of their book to prove it. If they failed one greek once, they were warned. If they failed twice, they were fired, and likely not hired to any other MM firm! Also, note that we do not yet know for sure the dealer's position in the underlying.

a. **Dealers warehouse their intraday risk until 2-3 p.m.**
   There is so much volume (particularly in 0DTE options) that dealers don't complete their hedging task until the end of the day. This was also noticed by the CBOE data team. This creates opportunity, but the fact that these strikes may not act as strong as they seem until closer to the end of the day. I refer to this timeframe as "dealer o'clock". The reason for this is if dealers dynamically hedge with all the 0DTE volume coming in, they will be swiftly whipsawed and lose money on positions. Dealers can sometimes warehouse their risk until the end of the day with market-on-close (MOC) orders to guarantee they close the day fully hedged.
b. **Dealers may hedge their exposure sooner if there is strong volatility.**
   If the market goes far out of bounds (based on the premiums dealers have collected), dealers will hedge before dealer o'clock. I would consider "out of bounds" greater than 1.5 times the opening straddle price as a rule of thumb. Dealers do like strong one-way movement, because then they can consistently hedge in one direction without fears of being whipsawed out of positions.
c. **Before 2:00 p.m. Eastern, delta and gamma have the largest effect on 0DTE – but have minimal impact on forecasting where price will go. Afterward, charm and vanna have a larger effect**.
   This assumes significant volume in 0DTE options, and must be checked against the cumulative effect in the exposure charts. That is, check the y-axis (notional dollars hedging) in the exposure charts by greek for the largest dollar impact at that time. The way to apply this principle is to determine the paradigm (as defined below), and when a line in the sand is breached, you can assume gamma hedging has begun. With dealers holding hedging more than delta requires, gamma hedging can have a profound impact on the overall market. More details below in the paradigm sections.

Principle #2:
Dealers have preferences in how to hedge their 0DTE risk.
0DTE risk can expand quickly. Therefore, dealers need to be nimble and react quickly. They have numerous tools in their arsenal to accomplish that. The following are those tools in order of preference:

1. Willing counterparty - If a dealer sells a 20 delta put, the best and easiest hedge is finding someone willing to sell their 20 delta put back to the dealer at a slightly cheaper price.
2. Underlying - Dealers hedge their deltas with underlying because it is cheap and effective. Directional greeks (delta, gamma, etc) are the only greeks that can be hedged through the underlying.
3. Price changes - In order to achieve a willing counterparty to a position that may be too extreme, dealers will simply change the price they are willing to pay for the spread. This is not preferred because changing the price beyond the best bid and offer will decrease the number of orders that are accepted by the MM and decrease their edge, and therefore their profits.
4. Trade options - This is least preferred because it changes all greek positions and when an MM becomes a liquidity taker, they lose some of their gross revenue.
5. Liquidate - If markets are in stress and dealer offside positions cannot be fixed through any of the methods above, they will liquidate their book, take their losses, and wait for a better time to trade. Besides the obvious, this creates ill will between the dealer and the exchange they rely on for volume in the future.

Note: Dealers hedge to deltas, not PnL.
The PnL follows the delta hedging. Therefore, vega and theta are not the greeks to focus on for 0DTE trading – vanna and charm are. On the 0DTE timeframe they tend to warehouse short volatility positions while dynamically hedging long volatility positions. They also use other options to hedge their volatility positions.

Principle #3:
Premium is 0 when options expire.
This is the primary difference between 0DTE and higher-order Volland. On a higher order Volland (particularly on the 30-day timeframe), there is a consistent spot-vol correlation that is the basis for skew, vanna moves, etc. 0DTE is simpler because IV and time premium run to 0. So, you know exactly the direction of IV and the impact on underlying hedging requirements.

a. **Charm and Vanna both need to be hedged in the same direction as IV approaches 0**.
Vanna is typically lower than charm in notional hedging needed, but because premium will run down to 0 no matter what underlying price does, charm and vanna will require hedging in the same direction. For this reason, I focus on charm, but targeting vanna can produce similar analysis.
b. **Charm/Vanna Balance allows less need for strong end of day hedging**.
Because premium trends to 0 no matter what on 0DTE, the flows could be very strong towards the end of the day.
c. **Gamma impact is inversely correlated to the remaining IV in the 0DTE vol plane**.
On all fronts, gamma impact is inversely correlated to the IV levels. IV reduces the impact of gamma quite a bit. Toward the end of a boring day where IV melts sooner than normal, gamma may have a stronger impact. The nature of gamma requires an outside force to make any sort of analysis on it effective, and sometimes that force is the vanna/charm impact as IV trends towards 0 anyway.

Principle #4:
0DTE options are cheap greeks.
While one 0DTE ATM option has a higher gamma than a 20DTE ATM option, its sphere of influence is much smaller. Therefore, as price moves, the greeks of the 0DTE option mean less. This is important because the initial option positioning will have less of an effect the further price moves away from it.

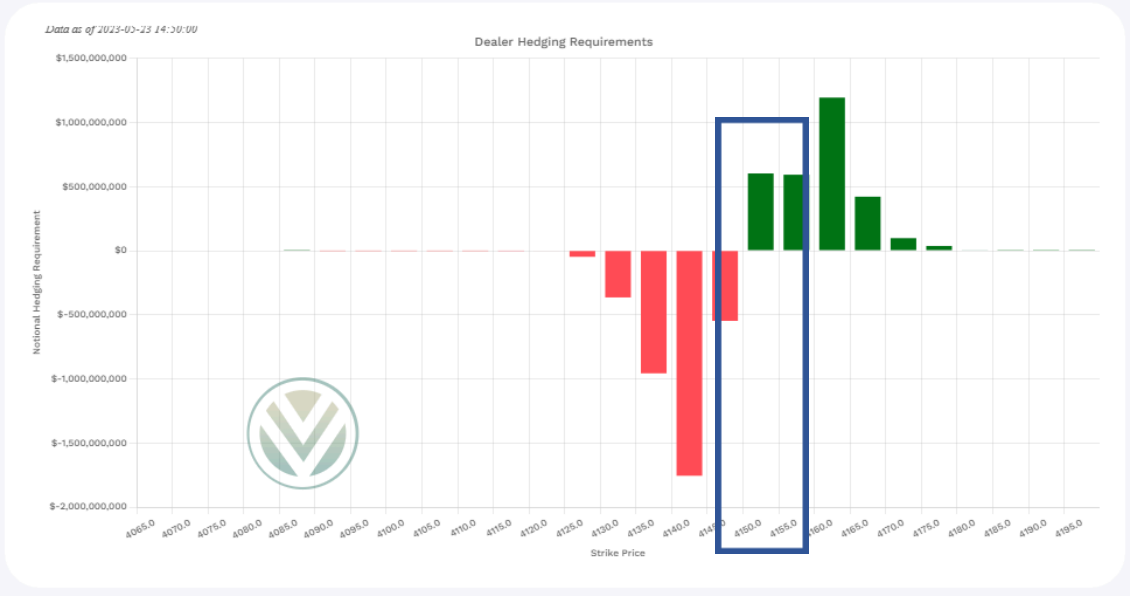
Principle #5:
One outside action can create acute moves in an intraday trading timeframe.
Many forces are trading in markets. At any given time a customer unrelated to options or dealers can trade in the underlying equity and force a short-term move that has nothing to do with 0DTE options. Further, dealers hold more than 0DTE options that allow them to distribute risk. That makes 0DTE a lot harder to trade and requires a comprehensive look at all flows. I suggest becoming familiar with an order flow tool that allows you to see when exactly the dealers are acting. Typically order flow tools will agree with a Volland assessment, and that is when to act when trading intraday.

0DTE Use Cases

How do you use 0DTE charts, and what do they mean? Because of 0DTE Principle 2, 0DTE charts are frequently uniform in nature. This has led to four formations that are the most common to see on charm charts during the day. The names are a nod to the 0DTE papers that first explained them. They are listed below in no particular order.

#1. The Bank of America paradigm: *Customers are buying calls and puts.*

JP Morgan and Bank of America both asserted that 0DTE is primarily customers' long calls and puts. They both came to different conclusions, with JP Morgan stating this can create a large 5% selloff while Bank of America is saying they are volatility suppressing. The answer is somewhere in the middle.



Above you see what the charm chart looks like in a BofA paradigm. Using Principle 3 above, the desire for dealers is to be charm/vanna neutral. The ideal area for that is between **4145-4150**, which is where price was when that screenshot was taken. However, if an outside party (or a higher-order hedge from a dealer) trades strongly in one direction or the other, the charm bars will flip their sign and price can begin to trend. This is because dealers will be hedging stronger charm/vanna flows as the trades become more one-sided. These are still “cheap greeks” to the extent that these trends are limited, I wouldn’t expect a 5% 0DTE move. Because dealers warehouse a lot of their premium intraday, in this paradigm they desire to stay between the levels where their payout is less than their premium. Those levels are called “lines in the sand”, where dealers give up hedging in favor of their premium and begin to gamma hedge. The gamma hedge tends to be done in triples, hedging triple the amount of gamma needed assuming a trend. When a line in the sand breaks, you will notice a 10-15 point move in a roughly 5 minute timeframe. It will create a new low/high that represents the new line in the sand where another round of gamma hedging would occur.

When a line in the sand is being tested, it tends to look like a short put-heavy GEX paradigm on the upside or a long call-heavy Anti-GEX paradigm on the downside. The 0DTE widget will tell

you whether it is a GEX, Anti-GEX, or BofA Line in the sand test. If it is a test, expect price to reverse in the range shown in the 0DTE widget.

2. The Sidial paradigm – *Customers are selling calls and puts.*

Kris Sidial of Ambrus Funds' white paper stated that customers are primarily selling puts and calls. This results in dealers being long calls and puts. Sidial contends that this will create volatility, because short gamma trades are inherently risky in nature and customers would take on margin calls as a result of strong moves.

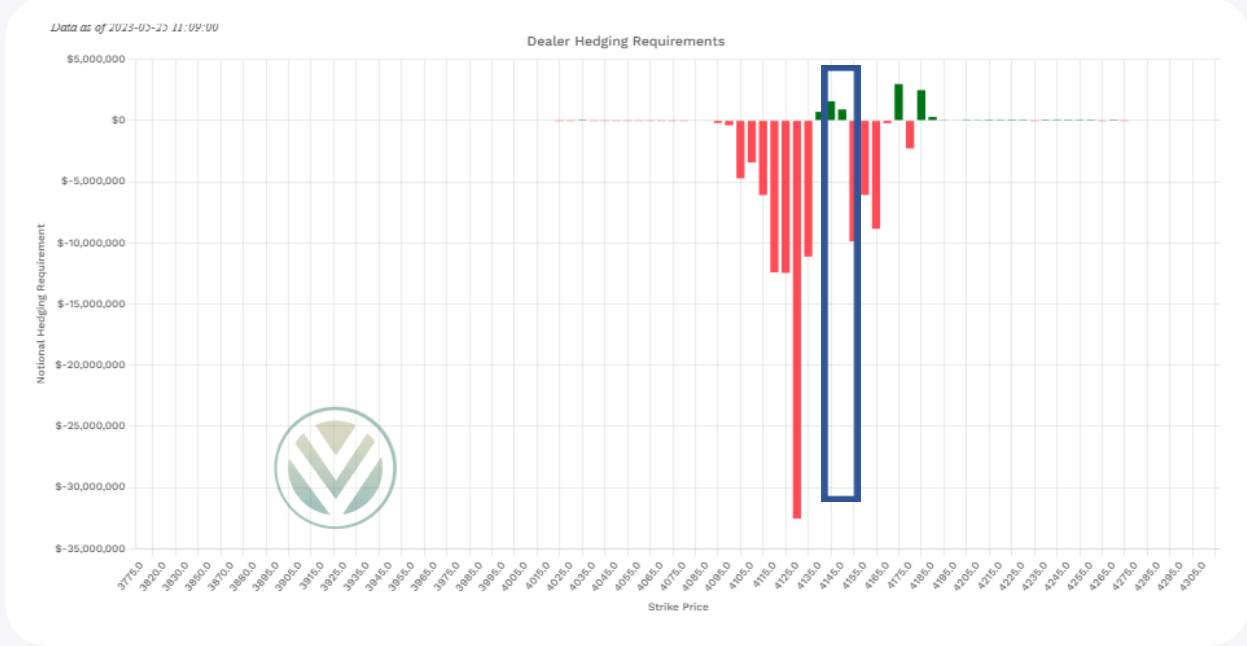
Volland is tasked with showing dealer positioning. It is not concerned with the behavior of customers. Because of that, it would have the opposite effect of the BofA paradigm. Dealers hold negative premiums that they make up for by dynamically gamma hedging. Dealers desire whipsaw or a strongly trending market. In this way, Kris is correct that Sidial paradigms can create volatility, but not necessarily in the way he stated in his paper, which is that it will presage a tail event. Essentially dealer hedging exaggerates all moves in this paradigm. Where price ends up depends on the customer trading of the underlying. If there is a strong trend, that is the desired result for dealers in this situation because they will be hedging and collecting payouts on their long options that are greater than the premiums they paid out.

In the chart above, **4205-4210** is roughly the balance point that dealers want to avoid. If trading futures, you will experience whipsaw, to the point that this is the most difficult paradigm to trade. Luckily this is also the rarest paradigm.

Sometimes when a GEX or Anti-GEX paradigm target is hit, it looks like a Sidial paradigm. The 0DTE widget will tell you whether it is a GEX, Anti-GEX, or Sidial paradigm. Targets are areas where dealer positioning is complete. They don't change their behavior, they just achieved their goal of being risk-neutral.

#3. The GEX paradigm – *Customers are buying puts and selling calls.*

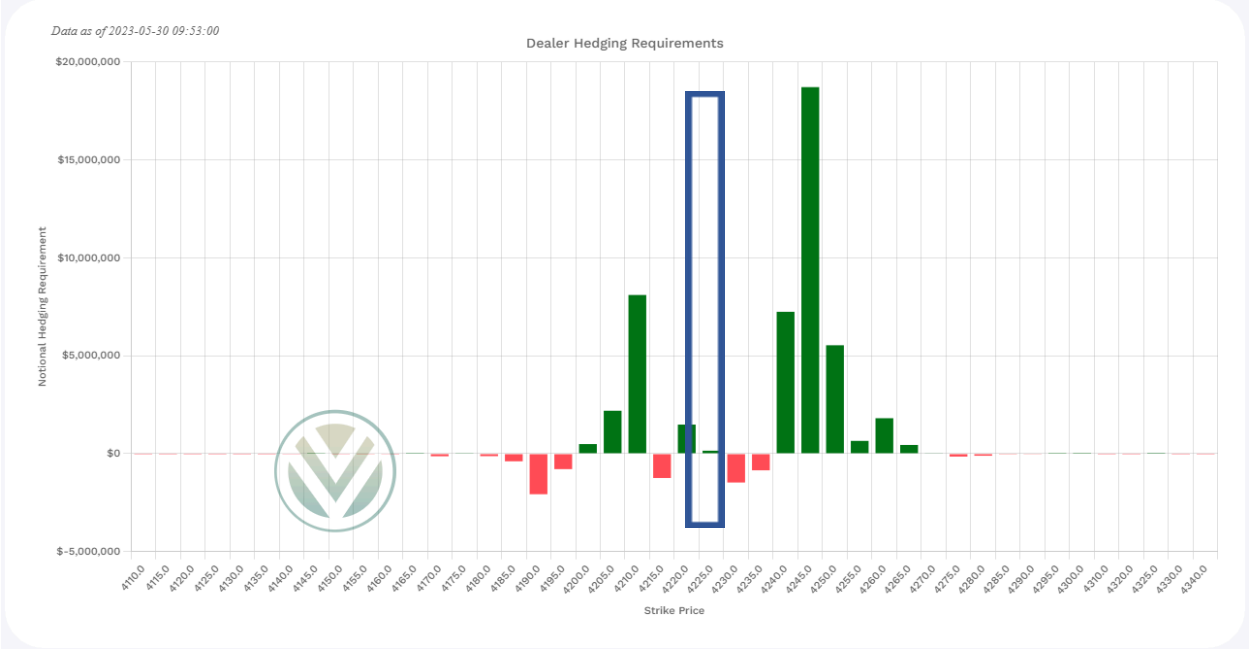
This is named after the SqueezeMetrics paper where the concept of dealer exposure was introduced. It was not intended as a 0DTE paper, but some other Twitter accounts contended that this is the primary use of 0DTE options, and sometimes it is. This is a bullish formation, with strong negative charm on both sides of the price. Remembering the concept that vanna and charm flip sign as you cross price and that dealers are seeking balance, this paradigm suggests price will increase until enough negative bars above price turn positive and make aggregate charm neutral.



In the chart above, **4150-4160** would need to turn positive and the red bars below 4125 would need to fade away (Principle 4). As a result, eyeballing it, 4160 is a target. If the market turns and sells off, however, the red bars below would turn to green, and dealers would assist the selloff as long as aggregate charm turns positive. This is what I refer to as the "line in the sand", where dealers start helping selloffs instead of working to reverse it. In the chart above, the "line in the sand" would be 4120-4125. Below there, dealers will be selling the underlying instead of buying it. To confirm it is a GEX target or a GEX line in the sand test, refer to the 0DTE widget. If it is a test or a target is hit, expect price to reverse in the range shown in the 0DTE widget. Targets are less likely to reverse than lines in the sand, but the range is more likely to hold with a line in the sand than a target. Sometimes further hedging happens with a test of the line in the sand, which lowers the line in the sand. Be careful of those flows and watch for that to happen if looking for a reversal.

#4. The Anti-GEX paradigm – *Customers are selling puts and buying calls.*

This is the opposite of the GEX paradigm. Essentially, everything I said for the GEX paradigm is opposite. The trend is bearish but has a bottom at the balance point. There would be a bullish line in the sand above current price that would flip aggregate charm and vanna to bullish if it is crossed, but the trend would be bearish in this paradigm.



In the chart above, price is at **4225** with a strong bearish charm outlook. That means this charm hedging would create a bearish trend until roughly 4200 where the charm at 4250 and thereabouts shrinks and the positive charm at 4210 flips to negative making it much less bearish and creating a balance. To confirm it is an Anti-GEX target or an anti- GEX line in the sand test, refer to the 0DTE widget. If it is a test or a target is hit, expect price to reverse in the range shown in the 0DTE widget. Targets are less likely to reverse than lines in the sand, but the range is more likely to hold with a line in the sand than a target. Sometimes further hedging happens with a test of the line in the sand, which lowers the line in the sand. Be careful of those flows and watch for that to happen if looking for a reversal.

"Messy" paradigms

As 0DTE trading evolves, there are more complex option positions put on in the 1DTE and 0DTE tenors. Large condors, butterflies, ratio spreads, etc. are being applied to take advantage of the unique environment of 0DTE options. These tend to disrupt the uniform paradigms we described above. They are called "Messy" paradigms.

Many times, messy paradigms evolve to look like one of the four paradigms mentioned above. However, if this doesn't happen, it is particularly helpful to see charm and gamma on a strike-by-strike basis to identify where there would be strong resistance or support. When 0DTE exposure is messy, it is harder to trade on a 0DTE timeframe (without uniform support or resistance).

How to Trade Each Paradigm

Using the principles above and these paradigm guides, you will get an idea of how to use these greeks to trade no matter what tool you use. Here's a quick guide on how to trade in each paradigm:

Paradigm	Futures/Stocks	Options
BofA	Bias Neutral. Fade large moves.	Sell iron condors or iron flies.
Sidial	Bias Volatile. Be nimble in your trade plan.	Buy straddles or long gamma. Low risk.
GEX	Bias Bullish. The closer markets are to the lines in the sand, the more confident your bullish trades should be. Sell when the target is reached.	Bullish short gamma; long gamma if target is greater than straddle price.
Anti-GEX	Bias Bearish. The closer markets are to the lines in the sand, the more confident your bearish trades should be. Buy when the target is reached.	Bearish short gamma; long gamma if target is greater than straddle price.

Paradigms can change, but typically once formed at around 10:30 a.m. Eastern, that is the paradigm for the rest of the day. That is far from a guarantee.

SWING TRADING

Swing Trading Framework

These are the core principles and assumptions underlying this framework. These principles are realistic and have shown to be true with our own observations and discussions with MMs. Under these principles will be their rationales.

Principle #1:
Dealers need to be fully hedged by the end of the day. This is also true in 0DTE.

a. **Dealer deltas at the beginning of the day are already hedged**.
   Since dealer deltas are fully hedged, the delta chart on Volland is only good to help guide conversations about how customers are positioned (through the inverse of Volland data). Differences also show how new positioning is applied throughout the day, and is accounted for in the summary delta hedging.
b. **Dealers hedge their vega positions, but not as fully as their delta positions.**
   While dealer deltas have a clear and easily measurable hedge, it is not as clear with vega. In SPX, vega is sometimes hedged with other options but is typically warehoused as a risk by dealers until they must hedge it. We do not yet have insight at this point to track counterparties and dealer positioning in those areas, but it seems that higher-tenored dealers hedge their vegas in 0DTE options if they are too imbalanced. Further, IV is hedged through a repricing of options. Otherwise, they are happy to collect premium on customer bought options, and will warehouse that risk unless they have to hedge it away. **Exercising options is net neutral.**
   While dealers may release /ES hedges from an excessive delta position that expires, they are typically already prepared for it through other options and 0DTE trading. Our informal studies of expiring delta positions in SPX have shown no correlation to opening price the next day.

Principle #2:
Dealers have hedging preferences.
They have numerous tools in their arsenal to accomplish that. The following are those tools in order of preference:

1. Willing counterparty - If a dealer sells a 20 delta put, the best and easiest hedge is finding someone willing to sell their 20 delta put back to the dealer at a slightly cheaper price.
2. Underlying - Dealers hedge their deltas with underlying because it is cheap and effective. Directional greeks (delta, gamma, etc) are the only greeks that can be hedged through the underlying.
3. Price changes - In order to achieve a willing counterparty to a position that may be too extreme, dealers will simply change the price they are willing to pay for the spread. This is not preferred because changing the price beyond the best bid and offer will decrease the number of orders that are accepted by the MM and decrease their edge, and therefore their profits.
4. Trade options - This is least preferred because it changes all greek positions and when an MM becomes a liquidity taker, they lose some of their gross revenue.

5. Liquidate - If markets are in stress and dealer offside positions cannot be fixed through any of the methods above, they will liquidate their book, take their losses, and wait for a better time to trade. Besides the obvious, this creates ill will between the dealer and the exchange they rely on for volume in the future.

Dealers hedge to deltas, not PnL. The PnL follows the delta hedging; therefore, dealer delta, vega, and theta are not the greeks to focus on. **Gamma, vanna, and charm** are the greeks to focus on. We focus on delta only as it relates to new positioning in the summary widget during the day.

Dealers do have to report their aggregate vega and theta positioning, but they tend to be risks that are warehoused or hedged through changing prices on options.

Principle #3:
The 2nd order greek with the most impact is the one with the *highest notional hedging*.

a. **Gamma, Charm, and vanna notional (15% on SPX) account for all delta hedging in existing positions.** As a result, this formula for existing positions is assumed to be true:
   (Gamma Exposure * Underlying Change)
   + (Aggregate Vanna * Fixed Price Vol Change)
   + (Aggregate Charm Exposure * Number of Days Passed)
   = Total Delta Notional Hedged

   When there are new trades applied during the day, those deltas will be accounted for by dealers and are accounted for in our hedging number. However, the *existing positioning* is the primary concern for swing trading because the higher-tenored positioning is mostly stable. **Gamma, vanna, and charm exposure change at the *end* of the day will be hedged - not at the beginning.** The less markets move, the more trivial this principle is. Because of this principle, you need to be able to predict the changes in the notional value based on the behavior of the Greek, the strike it is on, and the total notional at that strike.
b. **The ratio of each 2nd order Greek's notional hedging to the total affects its impact on dealer hedging.** If you read a gamma chart perfectly and it has little effect, it could be because vanna impact is far higher. The y-axis will show you the impact of each of these 2nd order greeks is most impactful to dealer hedging. In swing trading, typically vanna is the primary driver.

Principle #4:
Dealers account for 35-40% of all underlying movements. This statistic is based on a discussion with the CBOE data team and our own coefficient of determination on spot-vol correlation charts. While dealer hedging accounts for a majority of the underlying movement, there are other traders, including passive investors, hedge funds, stock traders, fundamental traders, technical traders, CTAs, ETF rebalancers, funds, and many other participants, Volland is only dealing with option dealer hedging requirements. Those other traders may oppose Volland, and it may not be a perfect match all the time. Volland shows just one (extremely significant) piece of the market flows puzzle.

Swing Trading Use Cases

Now that these principles are established, how do you use Volland charts to plan a swing trade?

A few ground rules first:

1. **Swing trading means trades you intend to hold for 10-45 days.** Many of these strategies would apply to shorter duration trades, but you will need to narrow the chart expiration range to better predict the short-term movements of the market.
2. **Options are my preferred tool for swing trading.** While owning the underlying stock is simpler and is ok to use for swing trading purposes, I like to use options because it allows for a more flexible thesis. For instance, I cannot trade short-volatility trades with stock.
3. **Unless otherwise specified, the second order greeks of all options must be accounted for.** This means that I will be always using "all expirations" on Volland when forming a thesis and trade plan.
4. **I do not try to predict new option trades.** I account for them when they appear and will account for historical trends such as monthly hedging trends, public large fund option purchases, or liquidity trends, but I'm not going to try to claim customers or dealers will act in an unpredictable way.
5. **I do not try to predict customer behavior.** I make no assumptions about how much customers are trying to hedge, or when a customer will be served with margin calls unless I know for certain that it will happen.

Step by step, here is how to look at each of these variables.

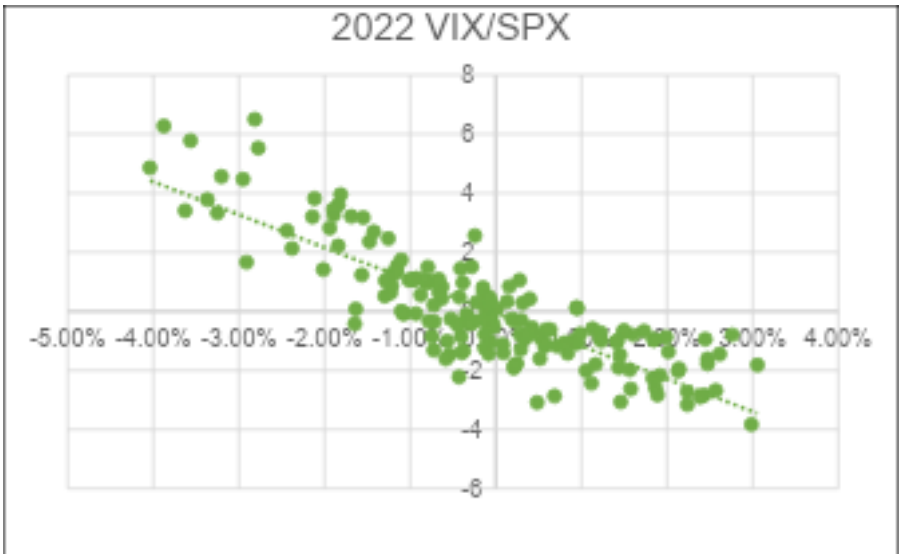
1. **Aggregate Gamma, Vanna, and Charm Exposure**: This is why you are subscribed to Volland. Volland is the most accurate tool to give these three critical notional values. You must also know how they are measured. Gamma is the change in deltas for every 1 point move in the underlying, vanna is the change in deltas for every 1% annualized move in implied volatility (the % number you always see for IV is an annualized percentage). Charm is the change in deltas for the passing of each hour. Note that the typical charm calculation is the passing of each day, but to be more granular, we changed it to every hour. Also note, sometimes the independent variable of charm is seen as a reduction of days until expiration (which would flip the signs we have in charm). We calculate it as days passing. As a result, negative charm is bullish while positive charm is bearish.

2. **Underlying Change**: This is the hardest variable to predict. There are many active traders in your underlying, and you need to account for them because they affect your gamma hedging calculations. Additionally, a lot of the movement is caused by dealers themselves which can create feedback loops. If something unexpected happens, there will be a lot of traders offside, including dealers. That means if you do not hold through events with unpredictable results, you may be able to effectively trade the aftermath of the event by predicting the dealer hedging required because of the event. Sometimes there are events that are unexpected and it hurts your position, but the aftermath is still affected by dealers, so you can see how they can help or hurt your position.

Still, it is helpful to have a thesis about how the other players in your underlying will trade, and it will also help to keep an eye on liquidity variables in your underlying to see how strong the hedging required will move the price.

3. **Change in Fixed Price Volatility**: Many IV calculations are based on aggregated numbers like the VIX index, but vanna hedging is based on the IV change in each particular option. That doesn't mean the larger scale numbers do not have a role to play. When you combine them with other analyses, it can help guide your IV thesis, then your overall underlying thesis. Here's some aspects of volatility to consider when making a thesis:

    a. **Spot-Vol Correlation**: IV tends to rise as stocks tend to fall. This is a common and true principle, but to what extent does IV rise as stocks fall? And how reliable is that measure?



This is an example of the daily 2022 spot-vol correlation between SPX and VIX. The formula **VIXchg = (-111.09 * SPXchg%) - 0.0613** is the correlation and can be simplified down to the statement: "Every 1-point increase in VIX will decrease SPX by 1.11%". When you ask how reliable that correlation is, you can look at the R^2. This correlation coefficient can be interpreted as how much of the dependent variable (SPXchg) is driven by the independent variable (VIX). .71 is an *extremely high number* particularly in financial measures, meaning the fidelity of this relationship is very sound. It may not be as sound in your stock. (Volland will soon provide data displaying these relationships in all the equities we offer.)

If you assume a spot-vol correlation, you can use it to convert IV predictions into underlying moves. This is very useful once you establish an underlying move thesis, you can include a multiplier representing the difference between your spot-vol correlation to the existing one to your underlying move thesis. This connects very well to the alternate definition of vanna, which is the change in vega for every 1 point move in the underlying. Spot-vol correlation can be seen in the "spot-vol correlation" widget for any of the equities we have.

A daily move with an outsized spot-vol correlation is typically caused either by an expected upcoming event or a lack of liquidity. The lack of liquidity is normally caused by customers overloading on one side of a trade, and is reflected in wider spreads between the bid and ask prices.

b. **Skew**: The spot-vol correlation is no secret. Dealers know it exists, and they use it to determine the skew in options. Using the example above, if you believe that the historical spot-vol correlation is going to be stable, but you notice that a 1-point increase in IV is priced for a .85% decline in SPX instead of the 1.11% the correlation is expecting, skew is pricing in higher volatility than the spot-vol correlation is implying. That means you might want to sell those options that are being priced too much.

   In short, skew is a prediction on the future spot-vol correlation. While skew is hard to predict, it generally increases as underlying moves exceed their implied moves significantly.

c. **Historical Volatility**: Historical volatility (or realized volatility) is the measure of volatility that has happened already. While it is by no means a predictor of future implied volatility, the difference between historical volatility and how much of that volatility was implied at the beginning of the tenor period is a true gauge of irrational fear or greed in the markets.

   If you believe historical volatility will continue on the pace it has, you can predict how implied volatility will react.

   Volland can help here. Typically, strong negative dealer vega suppresses volatility. This is because customers are already hedged for events, and IV expansion will require an even-larger event than what customers already hedged for. So, if you see a lot of positive aggregate dealer vanna in Volland and IV higher than HV, one can reasonably assume IV will fall and positive vanna will cause deltas to decline. The result is a measured bullish trend.

d. **Event Volatility**: Volatility associated with events normally goes away after the event occurs. If the event has a result that few were expecting, IV may go up as a result.

   Often, known events result in a reduction in implied volatility. Regular events have a history of realized volatility from the event and event volatility going into the event. These should be reviewed before making a thesis on event volatility.

These are some tips on predicting volatility. Implied volatility is easier to predict than underlying price moves, but it takes practice. Vanna is frequently the highest impact 2nd order Greek, so even though IV is easier to predict it can have the most impact on dealer hedging.

4. **Number of Hours Passing**: Time is so consistent; it is not even a variable. It is constant with its charm impact exponentially increasing as time passes. Charm is very rarely a concern to the swing trader since the time impact on options longer than 2 days out is

negligible compared to gamma and vanna effects. However, the shorter timeframe you have on your trade, the more charm matters.

Once you have a thesis on the direction of the variables above, you can use the dealer hedging page to help determine how strong of a move dealers will make. Compare that to the average equity daily notional on the dealer hedging page and see how strongly dealers will move the stock over time.

The basis of my swing trading involves the formula in Principle 3.a. That formula has all the variables needed to determine dealer hedging requirements and a thesis needs to be formed on each of them.

How to Trade Each Scenario

This quick reference guide can help with strategies in each scenario. In individual scenarios, there will always be exceptions, but this is a good place to start.

	Implied Volatility change greater than (>) spot-vol correlation		**Implied Volatility change less than (<) spot-vol correlation**	
	Drop	**Rise**	**Drop**	**Rise**
Predicted move **greater than (>)** Implied move	Offset Butterflies	Long Gamma Verticals	Offset Butterflies	Short Gamma Vertical
Predicted move **less than (<)** Implied move	Short Gamma Verticals	Calendars	ATM Butterflies or Iron Condors	Diagonals

THANK YOU

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