



VOLATILITY AND THE VIX[®] INDEX

Mandy Xu, Head of Derivatives Market Intelligence

July 2024



What is Volatility?

Which Stock is More Volatile?

NVDA



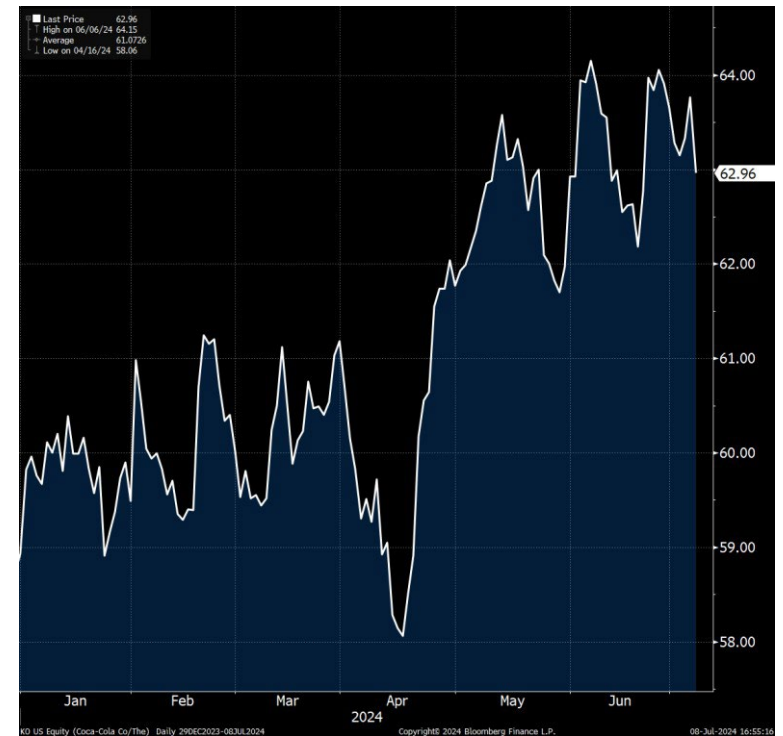
Source: Bloomberg

NVDA 3-month realized volatility: 55%

vs.

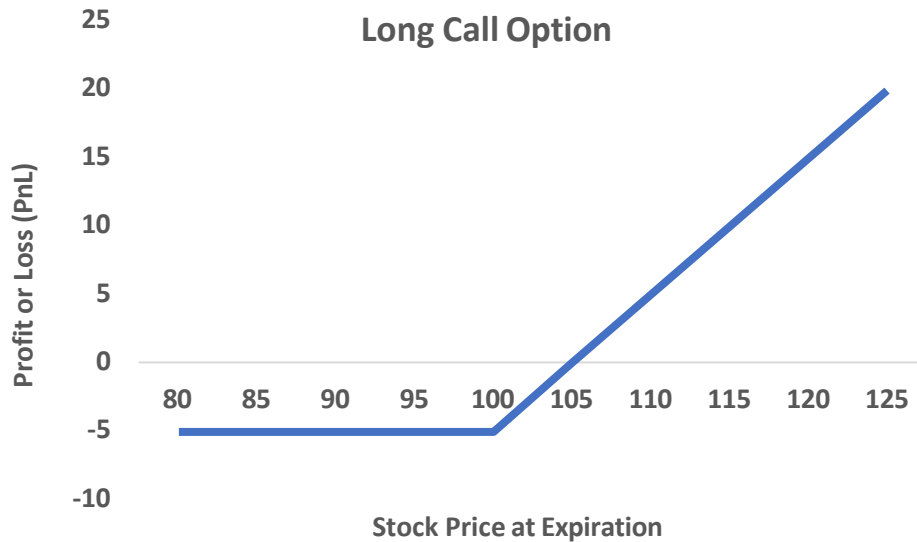
KO 3-month realized volatility: 12%

KO



Source: Bloomberg

What is Implied Volatility?



Source: Cboe

What Drives an Option's Value?

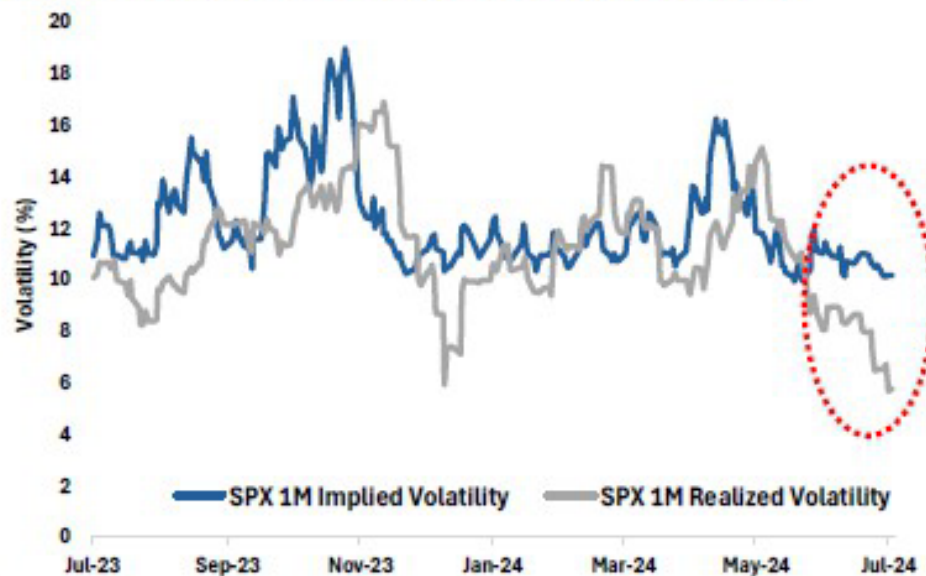
1. Stock Price
2. Strike Price
3. Time to Maturity
4. Dividends
5. Risk-free interest rates

6. Implied Volatility

Implied vs. Realized Volatility

- ▶ While implied volatility is derived from an option's price, realized volatility is a statistical measure (standard deviation of daily returns)
- ▶ Implied volatility is forward looking, realized volatility is backwards looking (i.e. historical volatility)
- ▶ Implied volatility typically trades at a premium to realized volatility > the difference is known as the Volatility Risk Premium (VRP)

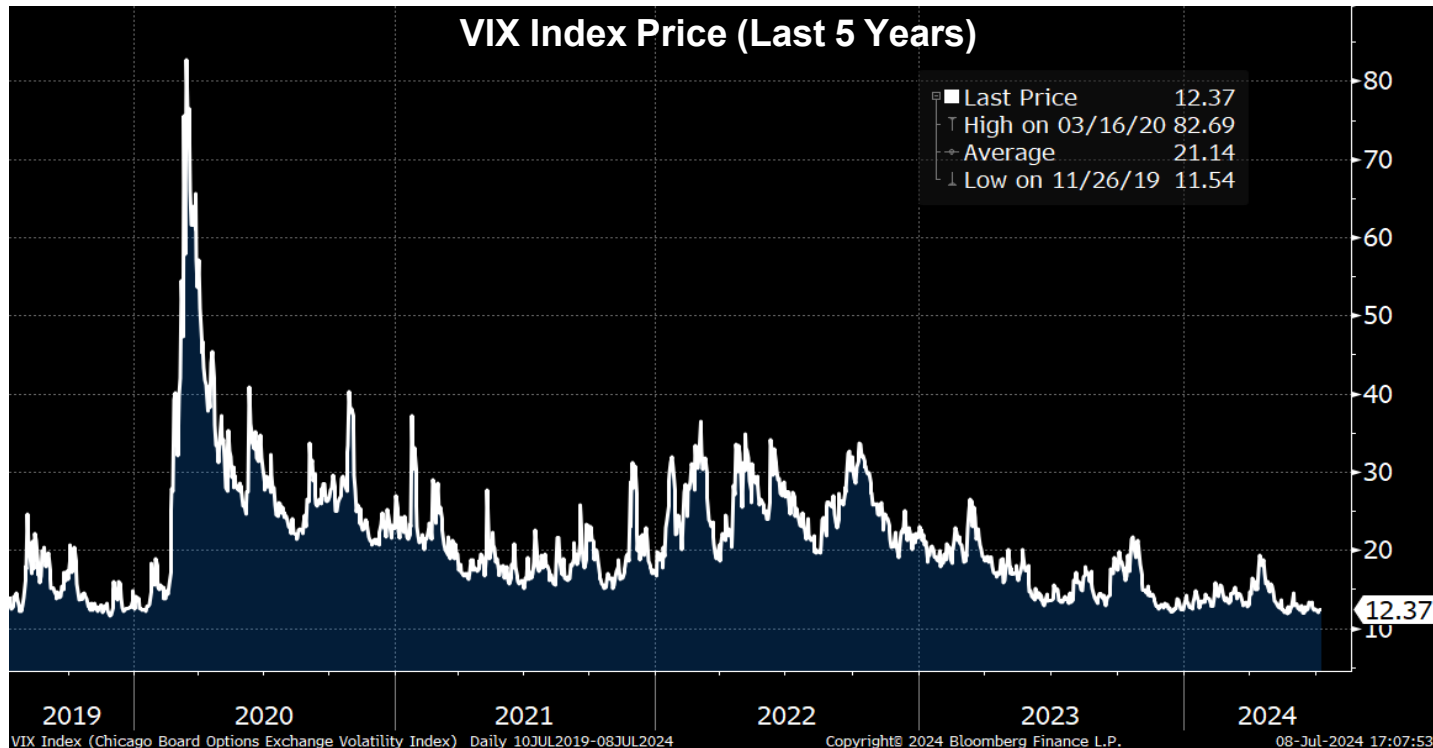
Exhibit 2: SPX Implied vs. Realized Volatility (1M)



Source: Cboe

What is the Cboe Volatility Index® (VIX® Index)?

- The benchmark for US equity implied volatility
- Measures how much the S&P 500® Index is expected to move in the next 30 days
- Convert into daily expected move using the “rule of 16”

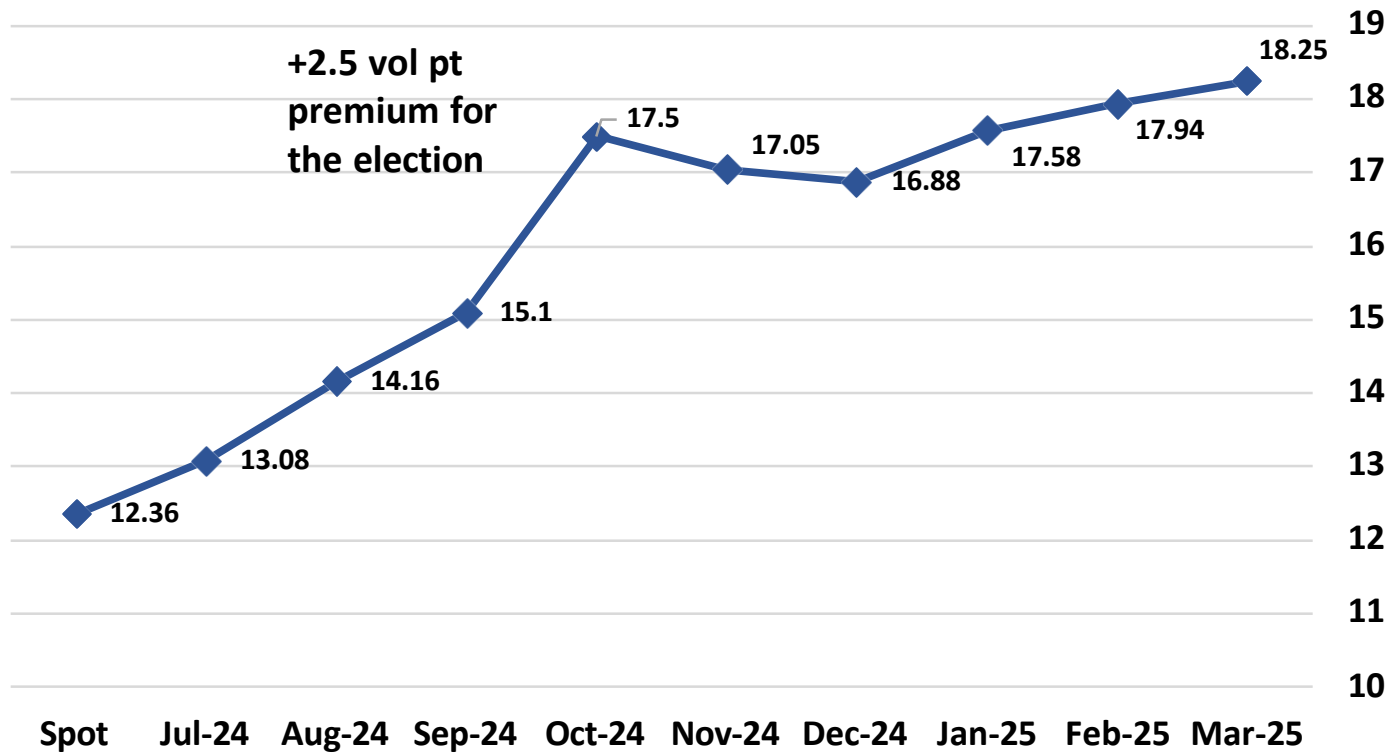




How to Trade Volatility?

Tradable VIX Products: VIX Futures

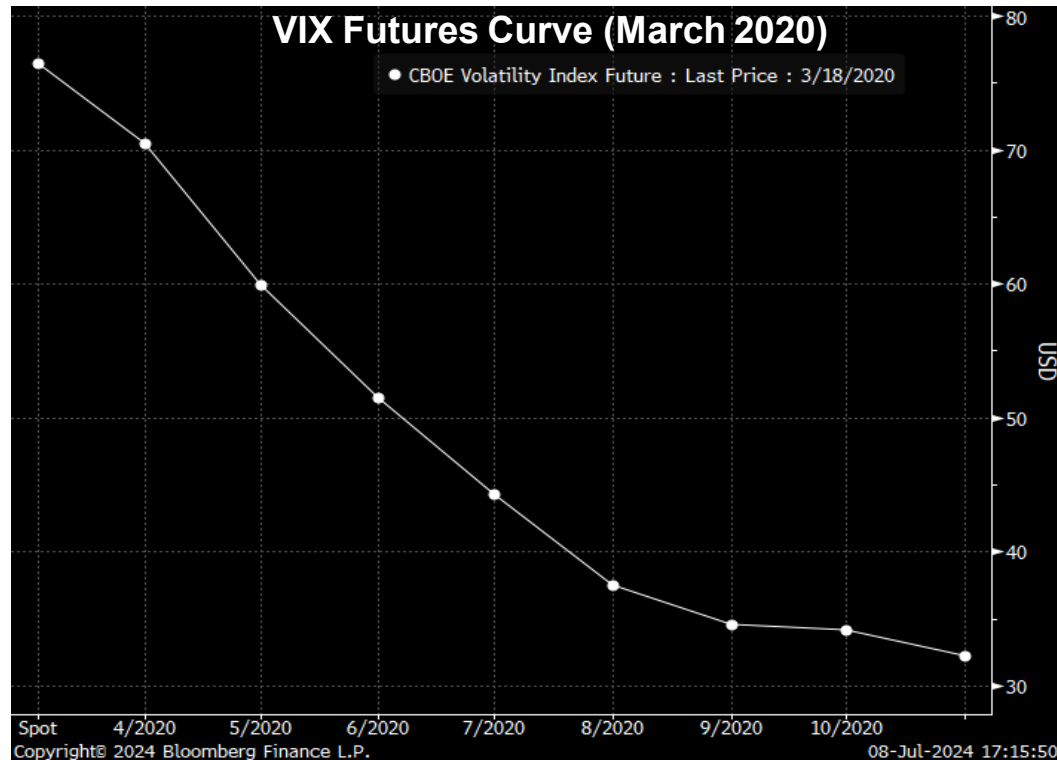
VIX Futures Curve



Source: Cboe

VIX Term Structure

- VIX futures term structure measures the expected volatility levels at different points in time
- Typically upward sloping (“contango”), term structure can become inverted (“backwardated”) when front-month futures trade at a higher level than longer-dated futures – typically during periods of crises



Source: Bloomberg

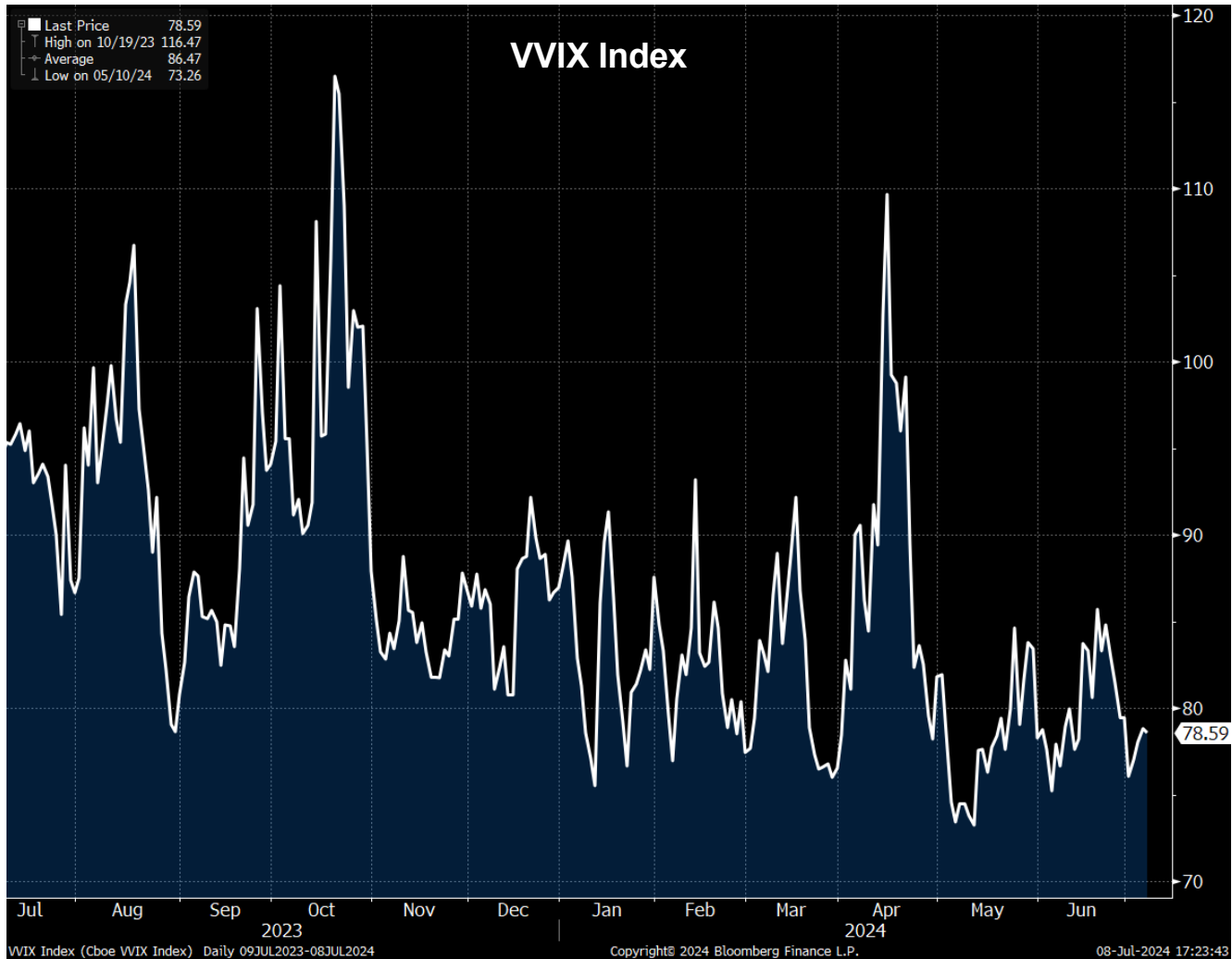
Tradable VIX Products: VIX Options

- VIX options are priced off the futures, not spot VIX index level
- Volatility of VIX options are significantly higher than that of the SPX options

VIX Index												
Option Monitor												
Cboe Volatility Index		12.37	-0.11	-0.8814%	/	Hi 12.91	Lo 12.31	Volm 0	HV 64.52			
Center 12.37		Strikes 10	Exp 17-Jul-24	Exch US Composite			97) Events Calendar EVTS »			Expiry Analysis OPX »		
Calc Mode As of < 08-Jul-2024 >												
Calls						Puts						
Ticker	Bid	Ask	Last	IVM	Volm	Strike	Ticker	Bid	Ask	Last	IVM	Volm
21-Aug-24 (44d); CSize 100; R 5.49; UXQ4 14.18						10	21-Aug-24 (44d); CSize 100; R 5.49; UXQ4 14.18					
11) VIX 8/21/24 C10.5	3.50	3.85	3.89y	44.05		10.5	11) VIX 8/21/24 P10.5	.06	.02	.02	55.80	14
12) VIX 8/21/24 C11	3.00	3.35	3.19	36.84	154	11.0	12) VIX 8/21/24 P11	.01	.08	.04	45.75	269
13) VIX 8/21/24 C11.5	2.58	2.86	2.72	41.01	5	11.5	13) VIX 8/21/24 P11.5	.05	.13	.10	46.21	447
14) VIX 8/21/24 C12	2.29	2.41	2.32	48.49	1300	12.0	14) VIX 8/21/24 P12	.15	.23	.18	49.20	244
15) VIX 8/21/24 C12.5	1.96	2.07	2.00	52.40	124	12.5	15) VIX 8/21/24 P12.5	.30	.36	.35	51.41	3369
16) VIX 8/21/24 C13	1.68	1.79	1.73	56.17	496	13.0	16) VIX 8/21/24 P13	.51	.57	.57	54.92	5129
17) VIX 8/21/24 C13.5	1.45	1.57	1.51	60.14	382	13.5	17) VIX 8/21/24 P13.5	.78	.89	.84	60.28	7181
18) VIX 8/21/24 C14	1.28	1.39	1.32	64.43	11378	14.0	18) VIX 8/21/24 P14	1.10	1.21	1.16	64.47	16483
19) VIX 8/21/24 C14.5	1.13	1.24	1.14	68.14	30537	14.5	19) VIX 8/21/24 P14.5	1.45	1.56	1.49	68.34	30389
20) VIX 8/21/24 C15	1.02	1.13	1.10	72.43	19441	15.0	20) VIX 8/21/24 P15	1.83	1.94	1.87	72.28	763
18-Sep-24 (72d); CSize 100; R 5.49; UXU4 15.11						10	18-Sep-24 (72d); CSize 100; R 5.49; UXU4 15.11					
21) VIX 9/18/24 C10.5	4.45	4.75	5.05y	46.01		10.5	21) VIX 9/18/24 P10.5	.05	.02y	.02y	48.58	
22) VIX 9/18/24 C11	3.95	4.30	4.17	44.56	45	11.0	22) VIX 9/18/24 P11	.07	.04y	.04y	46.51	
23) VIX 9/18/24 C11.5	3.50	3.85	3.75	45.03	20	11.5	23) VIX 9/18/24 P11.5	.05	.12	.07	43.06	10
24) VIX 9/18/24 C12	3.10	3.40	3.30	45.76	227	12.0	24) VIX 9/18/24 P12	.11	.18	.14	43.50	35
25) VIX 9/18/24 C12.5	2.82	2.95	2.91	48.47	201	12.5	25) VIX 9/18/24 P12.5	.24	.33	.27	47.44	15
26) VIX 9/18/24 C13	2.50	2.63	2.58	51.18	60	13.0	26) VIX 9/18/24 P13	.41	.52	.44	50.60	9803
27) VIX 9/18/24 C13.5	2.24	2.37	2.32	54.62	10	13.5	27) VIX 9/18/24 P13.5	.64	.75	.68	53.90	332
28) VIX 9/18/24 C14	2.02	2.15	2.10	57.93	84	14.0	28) VIX 9/18/24 P14	.91	1.03	.95	57.28	1035
29) VIX 9/18/24 C14.5	1.83	1.96	1.93	60.97	5	14.5	29) VIX 9/18/24 P14.5	1.22	1.34	1.26	60.56	34
30) VIX 9/18/24 C15	1.71	1.79	1.75	64.55	5408	15.0	30) VIX 9/18/24 P15	1.55	1.67	1.60	63.39	4717

Source: Bloomberg

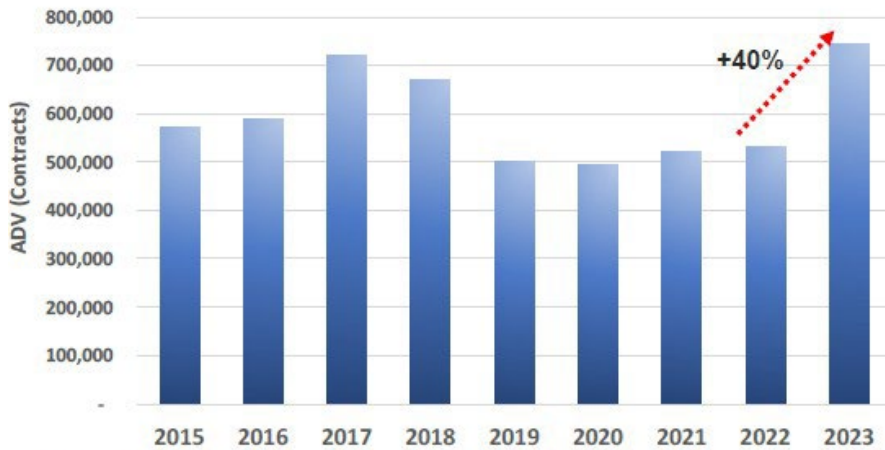
Volatility of the VIX Index: VVIX Index



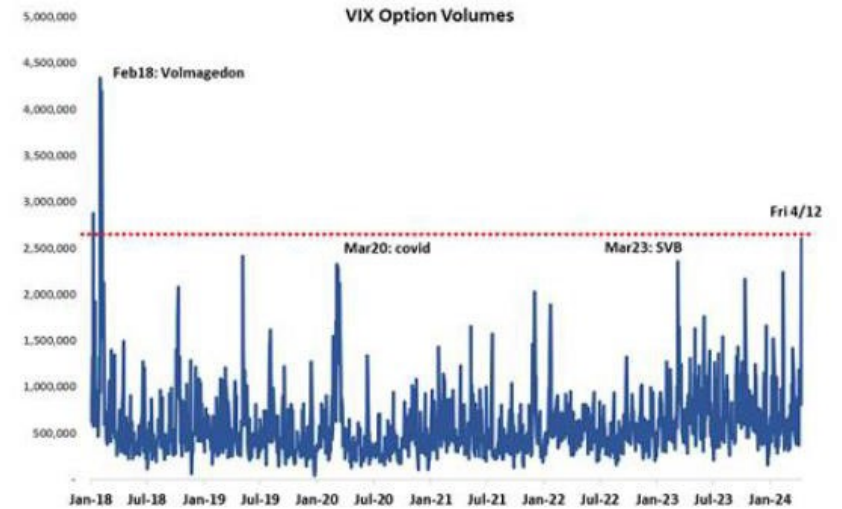
Source: Bloomberg

VIX Option Volumes on Pace to Set New Record

VIX Option Volumes on Pace to Set New Record



Source: Cboe



Source: Cboe

Is there a Volatility Index For Other Asset Classes or Other Tenors?"

- Credit Volatility Indices (Credit VIX):
 - VIXIG Index: 30-day implied volatility of investment grade CDX credit default swap spreads
 - VIXHY Index: 30-day implied volatility of high yield CDX credit default swap spreads
- U.S. Treasury Market Volatility Index:
 - VIXTLT Index: 30-day implied volatility of the TLT ETF (20+Year Treasury Bond ETF)
- Cboe Crude Oil Volatility Index:
 - OVX Index: 30-day implied volatility of the USO ETF (United States Oil Fund)
- Volatility Index for other tenors:
 - VIX1D Index: 1-day implied volatility of SPX options
 - VIX3M Index: 3-months implied volatility of SPX options
 - VIX6M Index: 6-months implied volatility of SPX options
 - VIX1Y Index: 1-year implied volatility of SPX options

Derivatives Market Intelligence

➤ To subscribe: <https://go.cboe.com/market-intelligence-content-subscription>



Macro Volatility Digest
July 8, 2024



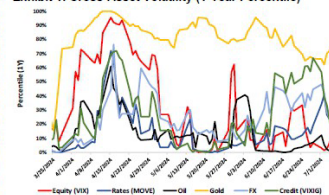
Volatility Insights
March 12, 2024

SPX® Realized Volatility Falls to a 4-Year Low

Weekly Market Commentary

Cross-Asset Volatility: Implied volatilities were mixed across asset classes last week on the back of slowing US economic data, with the market now fully pricing in two Fed rate cuts by year-end (75% implied probability of first rate cut by Sep). Oil, FX, and credit volatilities all fell while US equity, rates, and gold implied volatilities held steady. IG credit vol (VIXIG Index), for example, fell over 5 vol pts to 22.5 bps vol (from 67th percentile high to now 14th percentile low) as IG spreads tightened significantly. Oil 1M implied volatility declined by 2.5 vol pts to a new 1-year low of 23.8% - continuing to screen as the cheapest cross-asset vol. See Exhibit 1. Following this weekend's French election results, European assets have seen a significant decline in implied volatility, with V2X index down almost 7 pts from its recent high and the V2X-VIX® index spread normalizing to 0.6 pt (35th percentile low). EURUSD also led the decline in FX vols, with 1M implied now back down to 5.2% (6th %tile low).

Exhibit 1: Cross-Asset Volatility (1-Year Percentile)



Source: Cboe

Equity Volatility: While SPX 1M implied volatility held relatively steady last week at 10.2%, 1M realized volatility fell to a new 4-year low of 5.7% (-1.0 pt wk/wk). See Exhibit 2. As a result, the implied-realized volatility spread widened to 4.5% (96th percentile high). Despite low absolute levels of implied volatility, the even lower levels of realized means that the SPX volatility risk premium is near the highest in a year – trading on par with levels not seen since the April pullback and last year's Sep/Oct correction. In other words, while implied volatility is low, it's not "cheap" as cost of carry remains extremely expensive.

Exhibit 2: SPX Implied vs. Realized Volatility (1M)



Source: Cboe

Skew: SPX skew flattened modestly last week as equities rallied to new highs on the back of lower rates. SPX 1M skew (25-delta spread) narrowed from 2.8% to 2.5% (40th percentile) as demand for upside calls picked up.

Term Structure: SPX term structure steepened last week, led by the front-end of the curve, with the 1Y-1M vol spread widening from 4.5% to 4.7% (73rd percentile high).

Exhibit 3: Single Stock Volatility at Record High vs. Index



Source: Cboe

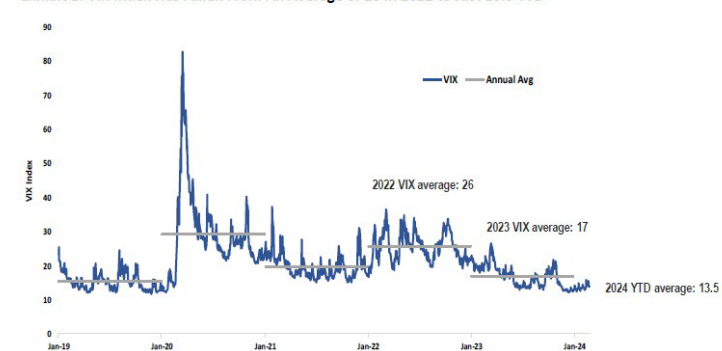
Correlation & Dispersion: As Q2 earnings kick off this week, what stands out is the extreme richness of single stock volatility ahead of earnings. S&P 1M implied dispersion, as measured by the DSPXSM index, jumped to near a record high of 31.3% last Friday while implied correlation, as measured by the COR1M index, fell to a new record low of 4.1% (for context, the 10Y average of COR1M index is 32%). In fact, the spread between 1M single stock implied volatility vs. SPX index volatility widened to a new record of 21.2% - exceeding the previous high set last July (see Exhibit 3).

Are Option Income Funds Suppressing Volatility?

What's Behind the Low VIX® Index Level?

Equity volatility has fallen significantly over the past year, with the VIX index declining from an average of 26 in 2022 to just 17 in 2023. The 9 pt year-over-year decline ranks as the 3rd largest annual drop in equity volatility on record, behind only 2010 (post-GFC) and 2021 (post-covid). So far, 2024 looks to be much of the same, with the VIX index averaging just 13.5 YTD, well below levels we saw even pre-pandemic.

Exhibit 1: VIX Index Has Fallen From An Average of 26 in 2022 to Just 13.5 YTD



Source: Cboe

Are Vol Selling Funds to Blame?

This large decline in volatility has not only been historic, but also surprising, which has led investors to round up the usual suspects of potential culprits. Chief among them, at least nowadays, is the [rise in popularity of yield enhancement ETFs and mutual funds](#) – so called “derivative income” funds – that sell covered calls or cash secured puts for income. Total AUM in these “derivative income” funds have grown a jaw-dropping sixfold since 2019, from \$20bn to now over \$120bn (see Exhibit 2). As you can see from the chart below, majority of that growth in recent years have come from the ETF space, with option-selling ETFs now rivaling their traditional mutual fund counterparts

THANK YOU

Disclaimers

There are important risks associated with transacting in any of the Cboe Company products or any digital assets discussed here. Before engaging in any transactions in those products or digital assets, it is important for market participants to carefully review the disclosures and disclaimers contained at: https://www.cboe.com/us_disclaimers/. These products and digital assets are complex and are suitable only for sophisticated market participants. These products involve the risk of loss, which can be substantial and, depending on the type of product, can exceed the amount of money deposited in establishing the position. Market participants should put at risk only funds that they can afford to lose without affecting their lifestyle.

© 2024 Cboe Exchange, Inc. All Rights Reserved.



**THE
EXCHANGE
FOR THE
WORLD
STAGESM**

This presentation includes market share, financials and industry data that we obtained from industry publications and surveys, reports of governmental agencies, third-parties and internal company surveys. Industry publications and surveys generally state that the information they contain has been obtained from sources believed to be reliable, but we cannot assure you that this information is accurate or complete. We have not independently verified any of the data and financials from third-party sources nor have we ascertained the underlying economic assumptions relied upon therein. Statements as to our market position are based on the most currently available market data. While we are not aware of any misstatements regarding industry data and financials presented herein, our estimates involve risks and uncertainties and are subject to change based on various factors.

Trademarks: Cboe®, Cboe Global Markets®, Cboe Volatility Index®, Bats®, BIDS Trading®, BZX®, BYX®, Chi-X®, Cboe Clear Europe®, EDGX®, EDGA®, ErisX®, MATCHNow®, and VIX® are registered trademarks of Cboe Global Markets, Inc. and its subsidiaries. All other trademarks and service marks are the property of their respective owners.

There are important risks associated with transacting in any of the Cboe Company products or any digital assets discussed here. Before engaging in any transactions in those products or digital assets, it is important for market participants to carefully review the disclosures and disclaimers contained at: <https://www.cboe.com/us/disclaimers>. These products and digital assets are complex and are suitable only for sophisticated market participants. These products involve the risk of loss, which can be substantial and, depending on the type of product, can exceed the amount of money deposited in establishing the position. Market participants should put at risk only funds that they can afford to lose without affecting their lifestyle. © 2023 Cboe Exchange, Inc. All Rights Reserved.