

The background of the slide is a high-angle, panoramic view of a city skyline at sunset. The sky is a mix of orange, pink, and light blue. The city buildings are densely packed, with many windows glowing with interior lights. The foreground is partially obscured by a large, white, semi-transparent triangular graphic that points towards the bottom right. The text is overlaid on this white area.

Volatility: A Look Back & A Look Ahead with Cboe Global Markets

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Cboe Global Markets

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Welcome to the end of a decade. Ready for your 2019 Wrapped?

- ❖ Hindsight is 20/20 – That’s the easy part
 - “Should have” bought AMD, XRX, LRCX, CMG, & TGT late last year.
- ❖ Volatility is a constant with negative connotation
- ❖ Volatility is also a meaningful source of future returns



❖ 2019: The Year began against a precarious backdrop

- The peak-to-trough move in 2018 was (19.8%)
- Largest pullback in the S&P 500® since March 2009
- 2011: PIIGS/U.S. Debt downgrade (19.4%)

❖ December 2018 (in particular) was difficult

- S&P 500® (9.18%) making lows on 12/24/2018 @ 2351

❖ U.S. 10 Year Yield 2018:

- 2.40% - 3.25%

❖ U.S. 10 Year Yield 2019:

- 2.80% - 1.43%



❖ The Federal Reserve “shifts”

- **October 3, 2018: Powell says “a long way from neutral” on rates**
- **January 3, 2019: Powell says “low inflation would allow Fed to be patient with rates”**
- **June: Powell says Fed “would act as appropriate to sustain the expansion (S&P 500 = Best June since 1955 +7.1%)”**

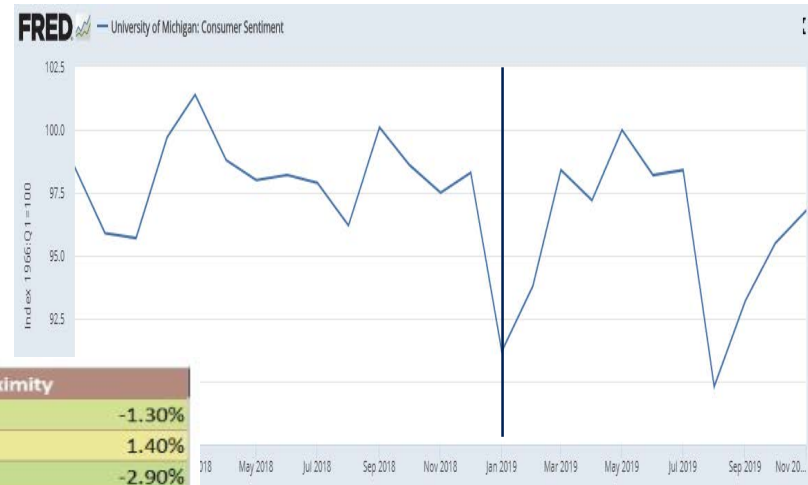


It's Certainly Not ALL About the Fed

❖ What Else Happened?

- Better than anticipated earnings!
- China “Trade Tensions” diminished (significantly)*
- General Economic Growth
- Strong Consumer Confidence

❖ The “experts” are just guessing too.....



Analyst	Bank/Org	target	Date issued	proximity
David Kostin	Goldman Sachs	3100	Jul-19	-1.30%
Tom Lee	Fundstrat	3185	Nov-18	1.40%
Tobias Levkovich	Citi	3050	Sep-19	-2.90%
Binky Chadha	Deutsche Bank	3250	Dec-18	3.47%
Scott Wren	Wells Fargo Institute	3030	Jul-19	-3.53%
Jonathan Golub	Credit Suisse	3025	Mar-19	-3.69%
Dubravko Lakos-Bujas	J.P. Morgan	3000	Jul-19	-4.49%
Julian Emmanuel	BTIG	3000	Dec-18	-4.49%
Kristina Hooper	Invesco	3000	Jul-19	-4.49%
Maneesh Deshpande	Barclays	3000	Dec-18	-4.49%
Sam Stovall	CFRA	2975	Dec-18	-5.28%
Lori Calvasina	RBC	2950	Mar-19	-6.08%
Savita Subramanian	Bofa	2950	Oct-19	-6.08%
Tony Dwyer	Cannaccord Genuity	2950	Dec-18	-6.08%
Mike Wilson	Morgan Stanley	2700	Nov-18	-14.04%



- ❖ What expectations did you have for 2019 at the end of last year?
 - Cliché: Expect the unexpected?

S&P 500[®] Annual Performance*



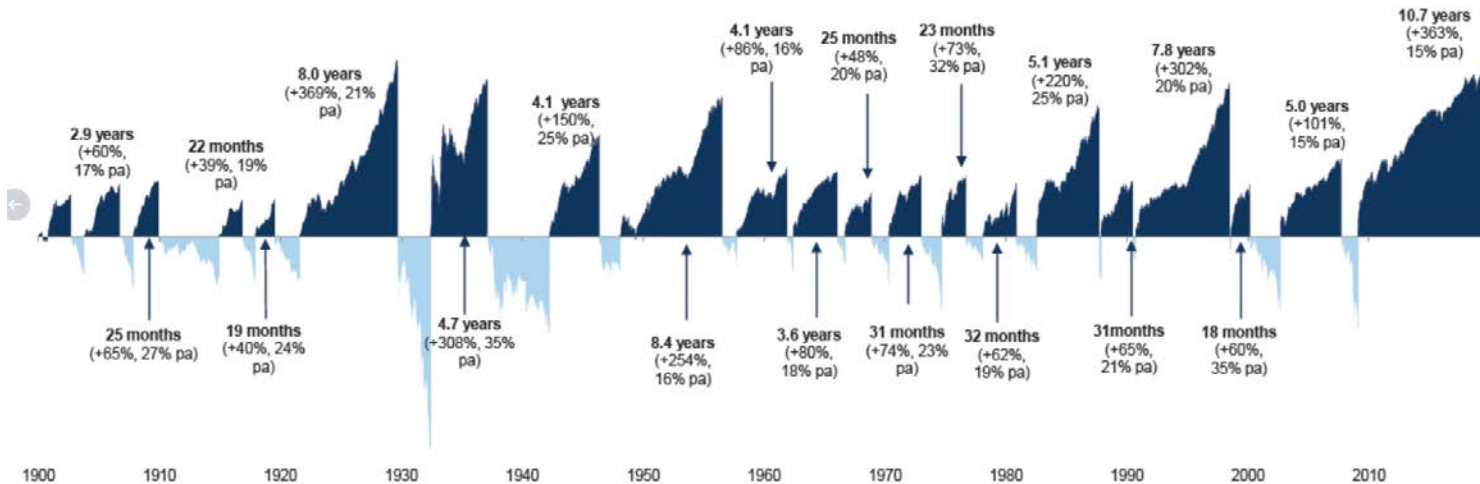
Quite Frankly (pun sort of intended):

❖ Sinatra might argue (appropriately) it's been a very good decade

- Nearly 11 years since a 20% S&P 500® drawdown
- 15% returns per annum (on average) +365% total

❖ Comparable in duration/returns to 1920s and 1990s

Exhibit 2: We are in the longest equity bull market without a 20% drawdown
S&P 500



Source: GFD, Datastream, Goldman Sachs Global Investment Research

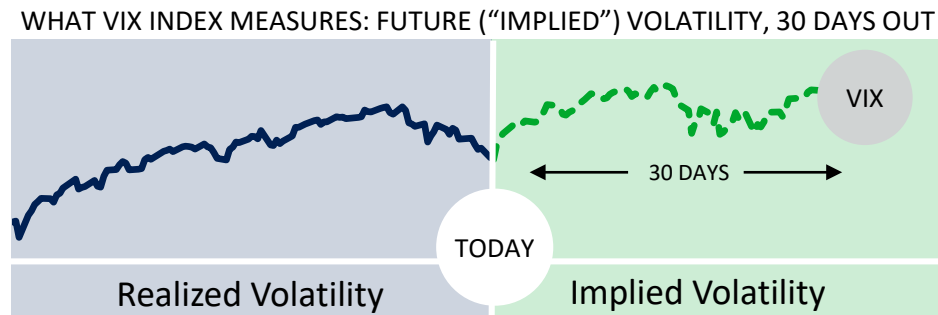
Or Perhaps Dylan Said it Best

- ❖ “You don’t need a weatherman to know which way the wind blows”
 - History is all well and good.....but it does me little good (tomorrow)



What Is The Cboe Volatility Index (VIX Index)?

The Cboe Volatility Index® (VIX® Index), projects the probable range of movement in the U.S. equity markets. Specifically, the VIX® Index measures the implied volatility of the S&P 500® Index (SPXSM) over the next 30 days.

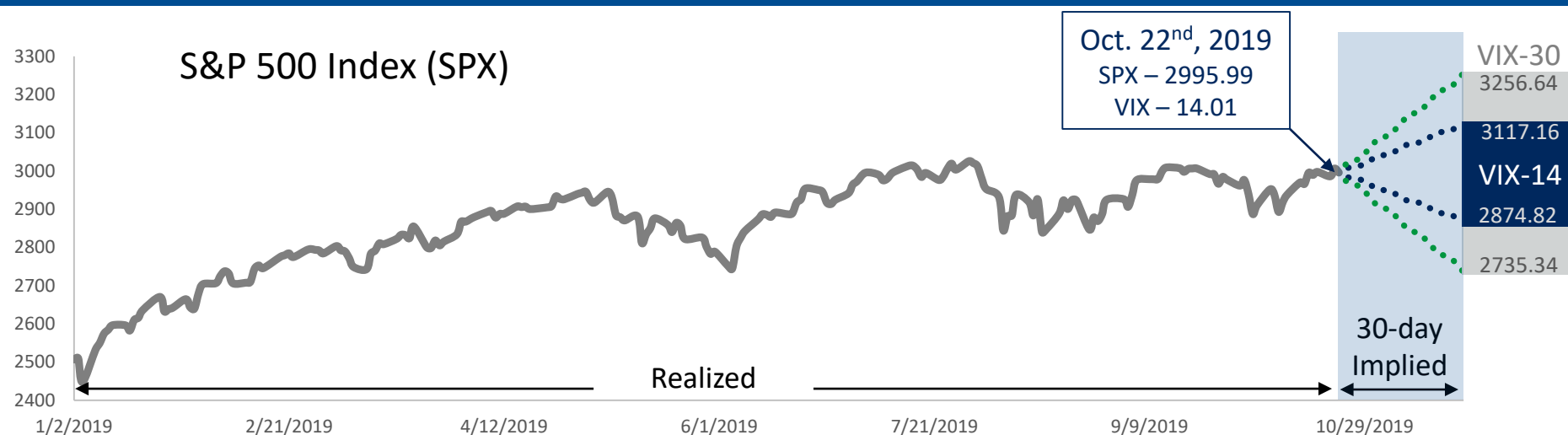


The VIX Index provides a glimpse into the market's expectations for the future which can be an extremely important tool for investors.

Investors can then use this information to better understand the magnitude of potential movements and how they might impact their portfolios - driving more informed investment decisions.



Forward Looking Indicator



- ❖ Volatility measures the frequency and magnitude of price movements, both up & down. The more dramatic the price swings, the higher the level of volatility.
- ❖ The VIX Index provides a constant, **30-day forward** look into expected (or implied) volatility of the U.S. stock market.
- ❖ Implied volatility is a statistical measure of how much a security or index will move over a future period of time. It does **NOT** predict direction, i.e. whether the index will go up or down.
 - 📌 A VIX level of 14 = +/- 4.04% move in the S&P 500 Index
 - 📌 A VIX level of 30 = +/- 8.66% move in the S&P 500 Index



From a Volatility Standpoint....

❖ 2019 was fairly pedestrian

- Avg. VIX Index: 15.44*
- High Close: 25.45 (1/3/2019)
- Low Close: 11.54 (11/26/2019)



- ❖ You cannot buy/sell the VIX Index
- ❖ You CAN buy/sell/spread VIX futures (& options)
- ❖ **Options price based on the associated future (NOT INDEX)**

Do you pay attention to term structure in VIX futures?



- ❖ 2019: 1 month S&P 500 realized vol ~12.7%*
 - Avg. VIX Index 15.44% Largest Drawdown
- ❖ 2018: 1 month S&P 500 realized vol ~17.1%
 - Avg. VIX Index 16.64% Largest Drawdown 19.8%
- ❖ 2017: 1 month S&P 500 realized vol ~6.8%
 - Avg. VIX Index 11.1% Largest Drawdown 2.8%
- ❖ Context:
 - 2008 RV ~41%
 - 1987: RV ~33.7%
 - 2009: RV ~27.2%



- ❖ Volatility Risk Premium (VRP) is a potential sources of alpha & better risk adjusted returns

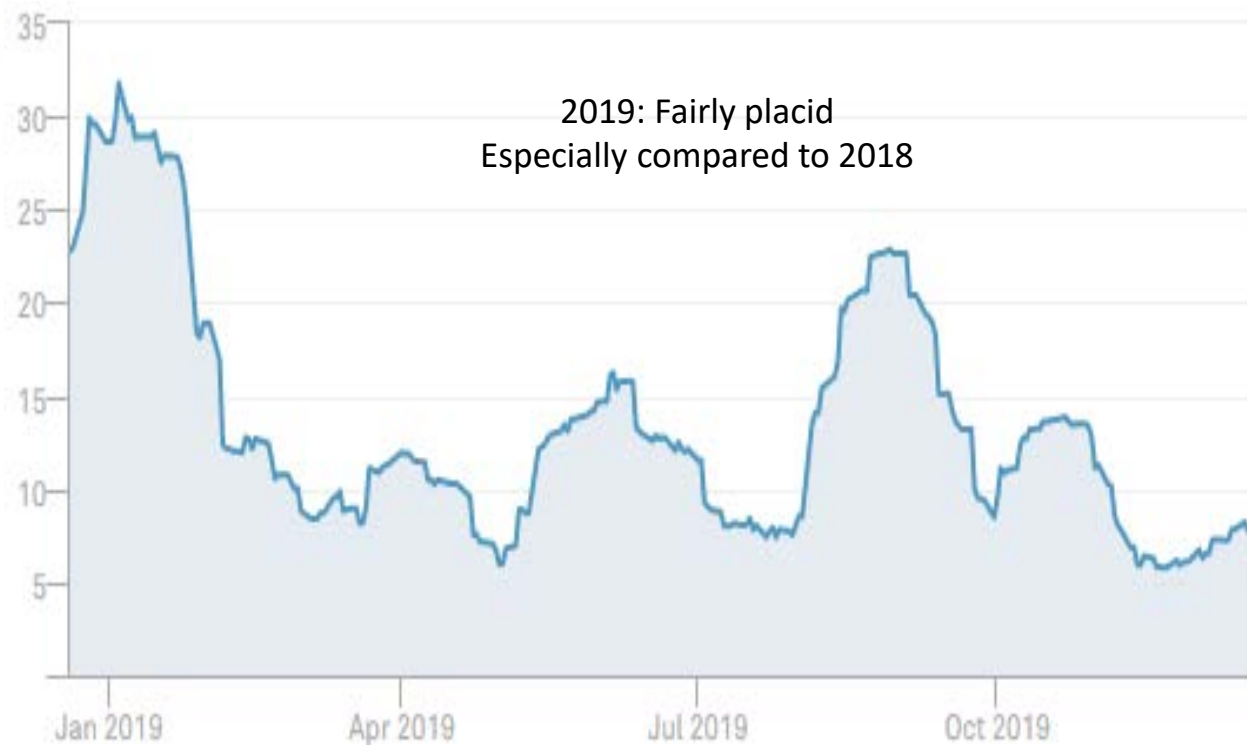
EXHIBIT 12 – VIX INDEX MINUS SUBSEQUENT S&P 500 1-MONTH REALIZED VOLATILITY ANNUAL AVERAGES (1990-2018)



Volatility: It Just IS

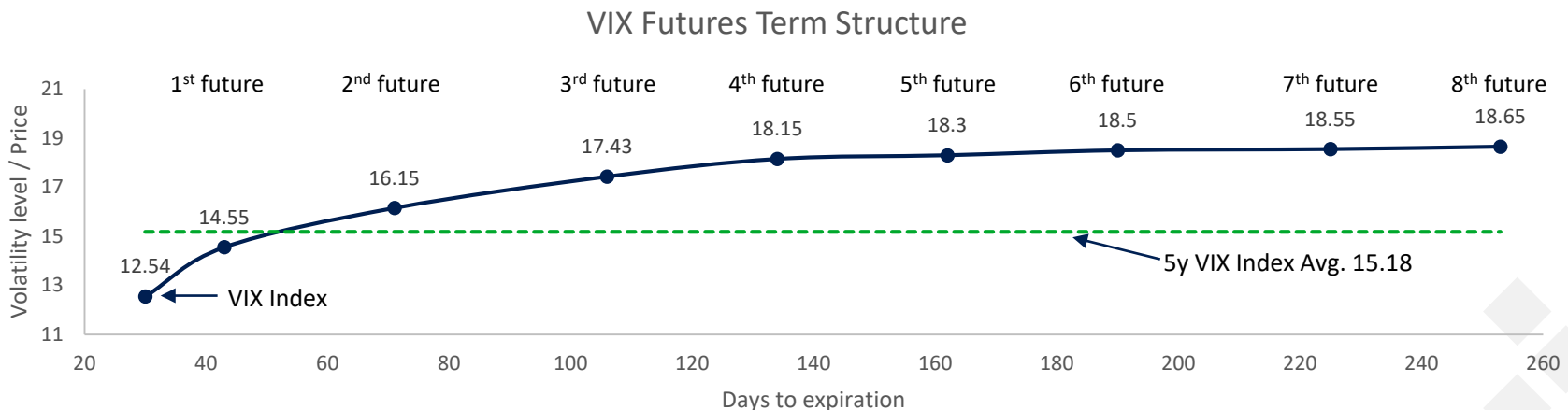
❖ Volatility is constant, but it ebbs and flows

- 3 year and 1 year periods
- 1 month volatility



From Index To Tradable Product

- ❖ The VIX Index provides important visibility into market sentiment but it is not a tradable product.
- ❖ To answer customer demand for a tradable product, Cboe listed both futures and options on the VIX Index.
 - 2004 Cboe launched VIX futures
 - 2006 Cboe launched VIX options
- ❖ Retail and institutional investors use VIX futures and options contracts much as they use futures and options contracts on other financial indices: to hedge their portfolios or to express a market view.



- ❖ Comparing price movement of the VIX Index against price movement of the S&P 500 Index (SPX) can signal trends in investor sentiment
 - Rising VIX Index + rising SPX = bearish sentiment, shrinking risk appetite, increased chance for a downside reversal.
 - Rising VIX Index + declining SPX = bearish sentiment, higher odds for a downside trend.
 - Declining VIX Index + declining SPX = bullish sentiment, growing risk appetite and high potential for an upside reversal
 - Declining VIX Index + rising SPX = bullish sentiment, higher odds for an upside trend.
- ❖ Common strategies using VIX futures and options
 - **Downside protection:** during a market selloff VIX futures tend to increase in value, owning VIX futures can help hedge against losses of a long equity portfolio.
 - **Mean reversion:** unlike many equity index products volatility tends to mean revert. Therefore, when volatility diverges from the historical mean, investors use both VIX futures and options to position themselves to benefit when it mean reverts.
 - **Contango vs. Backwardation roll:** depending on the market environment, investors buy/sell VIX future spreads to take advantage of changes in the VIX term structure.



Adoption Continues To Grow

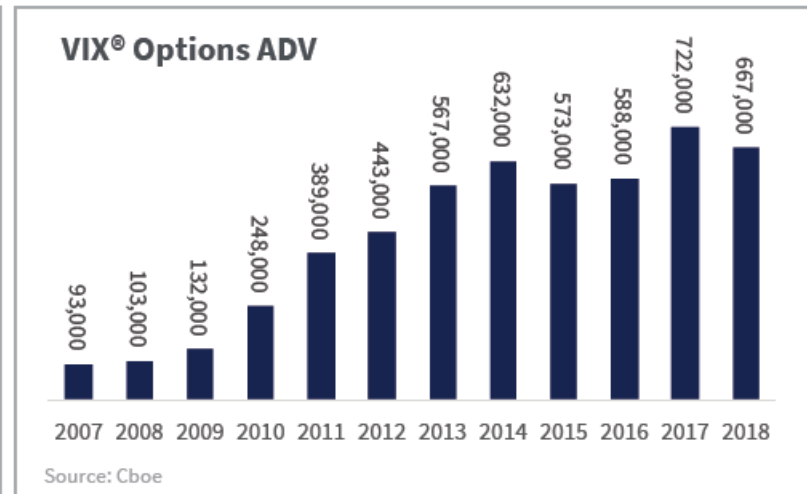
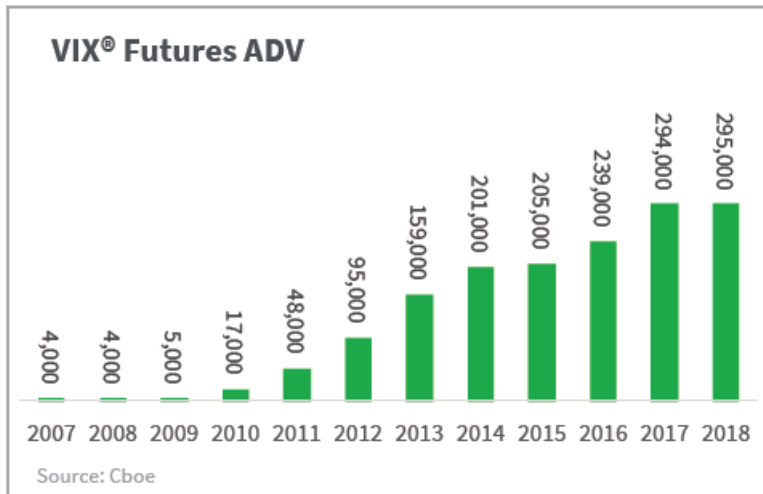


- ❖ For the past 15 years, VIX Index products have provided the marketplace with opportunities to hedge portfolios against market downturns, manage portfolio risk and smooth out volatility.
- ❖ During this time, Cboe has worked with market participants to enhance VIX futures and options trading and provide education to help grow the market.

VIX-related Benchmark Indexes

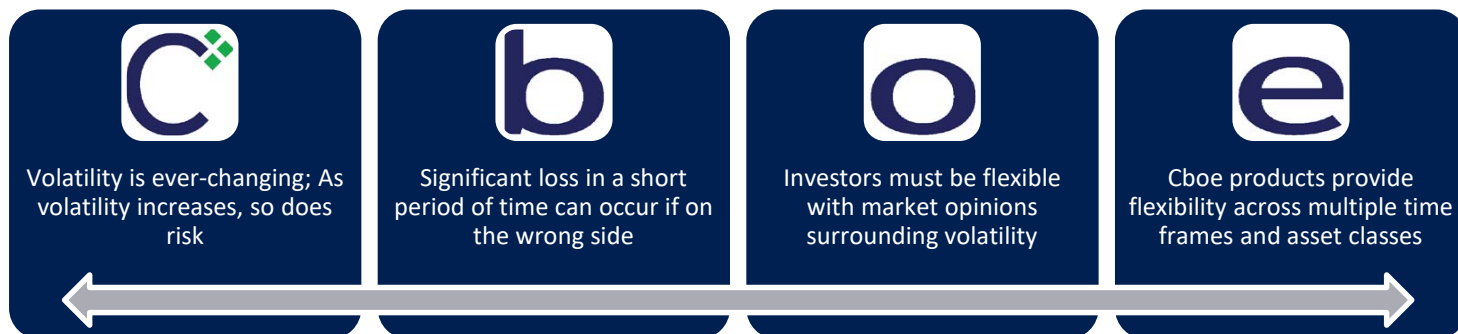
Ticker	Index	Sym
VPD	Cboe VIX Premium Strategy Index	VPD
VPN	Cboe Capped VIX Premium Strategy Index	VPN
VXTH	Cboe VIX Tail Hedge Index	VXTH
LOVOL	Cboe Low Volatility Index	LOVOL
VSTG	Cboe VIX Strangle Index	VSTG

Source: Cboe Global Markets



Quick Takeaways

- ❖ Volatility is constant, but the relative degree of volatility in the market fluctuates (meaningfully)
- ❖ Cboe invented the VIX methodology and applied it to the S&P 500 Index to create the VIX Index
- ❖ The VIX Index is a forward indicator (not tradable) that allows investors to predict future impacts on equity portfolios
- ❖ It does **NOT** predict direction, i.e. whether the S&P 500 Index will go up or down.
- ❖ The VIX Index typically has an inverse relationship to price movements in the SPX
- ❖ The VIX Index is one of the most recognized measures of volatility -- widely reported by financial media
- ❖ To answer customer demand, Cboe listed both futures (2004) and options (2006) on the VIX Index.
- ❖ Comparing price movement of the VIX Index against price movement of the SPX can signal trends in investor sentiment.
- ❖ Investors use VIX futures and options in multiple ways to express a market view or hedge portfolio risk.



Questions?

