Options on the S&P 500® Index offer investors the potential opportunity to manage large-cap U.S. equity exposure, mitigate portfolio risk, and generate additional options premium income.

Key features of the index options include:

**Large Contract Size**
- SPX options have a $100 multiplier and a large notional size that is: (a) around $300,000 when the S&P 500 Index is at 3,000, and (b) ten times the notional size of SPY and IVV ETF options. Investors may benefit from significant commission cost savings with the larger-sized SPX options.

**Volume and Open Interest**
- In 2019 (through September) SPX options average daily volume topped 1.28 million and maximum open interest exceeded 20 million contracts.

**Cash Settlement, European-Style Exercise, Global Hours**
- SPX options have these key features (not shared by ETF options): European-style exercise, with no risk of early assignment, and cash settlement with no unwanted delivery of shares. Global trading hours begin at 2 a.m. Central Time.

**Traditional A.M.-Settled SPX Options**
- Trading in the traditional SPX options ceases at the end of the business day (usually a Thursday) preceding the day on which the exercise-settlement value is calculated. The exercise-settlement value (ticker SET) is calculated using the opening sales price in the primary market of each component security on the expiration date, which usually is the third Friday of the expiration month.

**P.M.-Settled Expirations on Mondays, Wednesdays and Fridays**
- P.M.-settled SPX options (Weekly options with root symbol of SPXW) have settlements on Mondays, Wednesdays, Fridays, and on the last trading days of the month.

**FLEX® Options and Mini-SPX (XSP℠) Options**
- FLEX options permit the customization of key contract terms, such as exercise prices, exercise styles and expiration dates. Average daily volume for the cash-settled Mini-SPX (XSP) options (1/10 the size of the SPX options) grew to around 70,000 contracts in mid-2019.

**Price and Quote Transparency for SEC-Regulated Securities**
- Hybrid trading on competitive open outcry and electronic markets, with guarantees by the Options Clearing Corporation (OCC).

**Margin for Covered Calls with ETF Underlying**
- Cboe Regulatory Circular RG15-183 notes that Cboe rules allow a short position in a cash-settled index option established and carried in a margin account to receive covered margin treatment, if the short option position is offset in the same account by an equivalent position in an index-tracking ETF that is based on the same index that underlies the short option(s).

**Tax Treatment**
- Under section 1256 of the U.S. Tax Code, profit and loss on certain transactions in Cboe's options on stock indexes may be entitled to be taxed at a rate equal to 60% long-term and 40% short-term capital gain or loss, provided that the investor involved and the strategy employed satisfy the criteria of the Tax Code.

**Volatility Skew and Volatility Risk Premium**
- For the SPX options - (1) the implied volatility for OTM puts generally has been higher than for the ATM options or the OTM calls, and (2) the implied volatility generally has been higher than the realized volatility. See pages 3 and 4 for a discussion of strategies related to these concepts.

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*Investors should consult with their tax advisors to determine how the profit and loss on any particular option strategy will be taxed. Tax laws and regulations change from time to time and may be subject to varying interpretations. Sources for charts on this page: Cboe Exchange, Inc., Bloomberg and Cboe LiveVol.*
Term Structure The implied volatilities for SPX options can vary, depending on factors such as the moneyness and time to expiration.

Term Structure - VIX9D, VIX, VIX3M, VIX6M and VIX1Y on Two Dates in 2019
The 9-day expected volatility of SPX options rose from 12.19 on July 24 to 29.14 on August 5. There were smaller rises in SPX options 30-day (and 3-month, 6-month and 1-year) expected volatility.

SPX Options Term Structure at Close on Sept. 23, 2019
Near-term OTM SPX puts had higher implied volatility.

SPX 500 Index
Many investors who trade SPX options track the VIX® and SKEW indexes to monitor changes in expected volatility and skew.

SKEW, VIX and SPX Indexes Since 1990

In 2017 the average daily closing level was the highest ever for SKEW Index, and lowest ever for VIX Index.

Annual Statistics

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>% Change</td>
<td>S&amp;P 500</td>
<td>-38.5%</td>
<td>23.5%</td>
<td>12.8%</td>
<td>0.0%</td>
<td>13.4%</td>
<td>29.6%</td>
<td>11.4%</td>
<td>-0.7%</td>
<td>9.5%</td>
<td>19.4%</td>
<td>-7.0%</td>
</tr>
<tr>
<td></td>
<td>VIX Index</td>
<td>77.8%</td>
<td>-45.8%</td>
<td>-18.1%</td>
<td>31.8%</td>
<td>-23.0%</td>
<td>-23.9%</td>
<td>39.9%</td>
<td>-5.2%</td>
<td>-22.9%</td>
<td>-21.4%</td>
<td>156.7%</td>
</tr>
<tr>
<td>Avg. Daily Close</td>
<td>VIX Index</td>
<td>32.7</td>
<td>31.5</td>
<td>22.5</td>
<td>24.2</td>
<td>17.8</td>
<td>14.2</td>
<td>14.2</td>
<td>16.7</td>
<td>15.8</td>
<td>11.1</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>SKEW Index</td>
<td>113.7</td>
<td>118.1</td>
<td>121.1</td>
<td>122.5</td>
<td>120.8</td>
<td>122.4</td>
<td>129.8</td>
<td>127.5</td>
<td>127.6</td>
<td>134.8</td>
<td>132.6</td>
</tr>
</tbody>
</table>

For all years since 1990, the highest values are in green and the lowest values are highlighted in red. www.cboe.com/volatility.
Options on S&P 500® Index
Tools to Manage Large-Cap U.S. Equity Exposure

Index Options Strategies

Strategies Cboe’s SPX options are designed to provide investors ways to efficiently gain exposure to the global equity markets and execute risk management, hedging, asset allocation and income generation strategies. www.cboe.com/strategies. Some of the many index options strategies include:

- Hedge Downside
- Protective Puts
- Low-cost® Hedging
- Collars and Put-Spread Collars
- Combination
- Iron Condors and Iron Butterflies
- Income Generation
- Buy-Writes and Cash-Secured Put-Writes

Implied Volatility Risk Premium (IVRP) The implied volatility of SPX options often has exceeded the subsequent realized volatility for the SPX Index. The IVRP has facilitated strong risk-adjusted returns by certain options-selling benchmark indexes over more than 33 years (see sections below), but during the past year there have been periods in which SPX realized volatility exceeded the VIX Index.

Benchmark Indexes and Performance

Dozens of Benchmark Indexes For investors who would like to compare how hypothetical options-based strategies have performed, Cboe offers dozens of benchmark indexes that sell and/or buy SPX options, including indexes that use 1-week or 1-month options, the Cboe S&P 500 Buffer Protect Index Balanced Series, Cboe S&P 500 Dividend Aristocrats Target Income Index, and several other indexes.

Performance Since Mid-1986 Cboe’s BXMD Index sells OTM SPX options and had higher returns than six other benchmark indexes in this chart.
Options on S&P 500® Index
Tools to Manage Large-Cap U.S. Equity Exposure

Benchmark Indexes and Performance, Cont.

Higher Risk-Adjusted Returns and Lower Volatility

Less Severe Drawdowns and Higher Risk-Adjusted Returns When compared to the 2 stock indexes in the table below, all 7 options-based indexes had less severe maximum drawdowns and lower betas. The PUT, BXMD, BXM and RXM indexes all had higher risk-adjusted returns (as measured by the Sharpe and Sortino ratios).

<table>
<thead>
<tr>
<th>Index Name</th>
<th>Maximum Drawdown</th>
<th>Annualized Return</th>
<th>Standard Deviation</th>
<th>Beta vs. Market</th>
<th>Alpha vs. Market</th>
<th>Sharpe Ratio</th>
<th>Sortino Ratio (MAR = 0.00%)</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNDR℠ - Cboe S&amp;P 500 Iron Condor Index</td>
<td>-13.7%</td>
<td>6.2%</td>
<td>7.2%</td>
<td>0.17</td>
<td>4.6%</td>
<td>0.41</td>
<td>1.14</td>
<td>-1.99</td>
</tr>
<tr>
<td>RXM℠ - Cboe S&amp;P 500 Risk Reversal Index</td>
<td>-26.8%</td>
<td>7.4%</td>
<td>8.6%</td>
<td>0.48</td>
<td>2.3%</td>
<td>0.48</td>
<td>1.19</td>
<td>-2.12</td>
</tr>
<tr>
<td>PUT℠ - Cboe S&amp;P 500 PutWrite Index</td>
<td>-32.7%</td>
<td>9.6%</td>
<td>9.9%</td>
<td>0.56</td>
<td>3.7%</td>
<td>0.64</td>
<td>1.31</td>
<td>-2.08</td>
</tr>
<tr>
<td>CLL℠ - Cboe S&amp;P 500 95-110 Collar Index</td>
<td>-35.5%</td>
<td>7.0%</td>
<td>10.6%</td>
<td>0.65</td>
<td>0.3%</td>
<td>0.35</td>
<td>1.07</td>
<td>-0.17</td>
</tr>
<tr>
<td>BXM℠ - Cboe S&amp;P 500 BuyWrite Index</td>
<td>-35.8%</td>
<td>9.6%</td>
<td>9.9%</td>
<td>0.56</td>
<td>3.7%</td>
<td>0.64</td>
<td>1.31</td>
<td>-2.08</td>
</tr>
<tr>
<td>PPET℠ - Cboe S&amp;P 500 Put Protection Index</td>
<td>-38.9%</td>
<td>6.9%</td>
<td>12.1%</td>
<td>0.75</td>
<td>-0.7%</td>
<td>0.31</td>
<td>0.89</td>
<td>-0.28</td>
</tr>
<tr>
<td>S&amp;P 500 Index</td>
<td>-38.9%</td>
<td>6.9%</td>
<td>12.1%</td>
<td>0.75</td>
<td>-0.7%</td>
<td>0.31</td>
<td>0.89</td>
<td>-0.28</td>
</tr>
<tr>
<td>MSCI EAFE® (US$)</td>
<td>-56.7%</td>
<td>6.1%</td>
<td>16.9%</td>
<td>0.80</td>
<td>-1.3%</td>
<td>0.17</td>
<td>0.54</td>
<td>-0.4</td>
</tr>
<tr>
<td>S&amp;P GSCI</td>
<td>-80.9%</td>
<td>3.4%</td>
<td>20.2%</td>
<td>0.26</td>
<td>2.6%</td>
<td>0.01</td>
<td>0.24</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

Sources: Zephyr StyleAdvisor and Cboe Exchange Inc.

Monthly Options Income

Other Related Index Options Cboe also offers cash-settled options on the VIX®, the S&P 100® (OEX) Index, and on 11 Select Sector Indexes.

White Papers by Aon Hewitt, Wilshire, Callan, Meketa, Cambridge, Asset Consulting Group and other firms are at www.cboe.com/BenchmarksPapers

Please visit Cboe.com/SPX for more details.

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