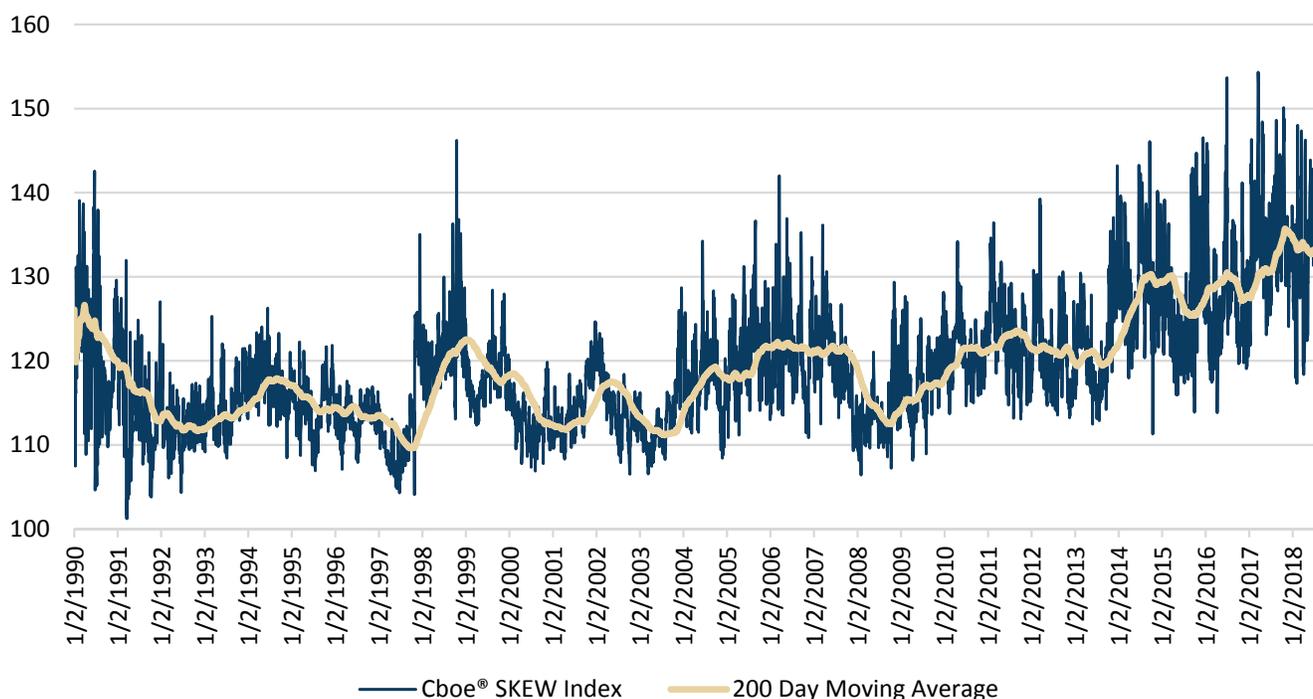


A relatively unknown and often misunderstood options market indicator got some attention for record setting levels in the third quarter. The Cboe® SKEW Index (SKEW) set a new all-time high of 159.03 on August 13th and the third quarter average of 144.74 was its highest quarterly average ever. SKEW is generally considered a measure of the *perception* of 'tail risk,' or downside market events that are large enough to be statistical outliers.¹ Perception is a key word because very high SKEW readings have not been shown to have any capacity to reliably predict downside events.²

It is interesting to note, as Exhibit 1 shows, that very high SKEW during the third quarter was a continuation of an upward trend in SKEW that has been in place throughout the current equity bull market.

Exhibit 1: Cboe® SKEW Index: Daily Prices and Moving Average
1/2/1990 to 9/28/2018



Source: Bloomberg, L.P.

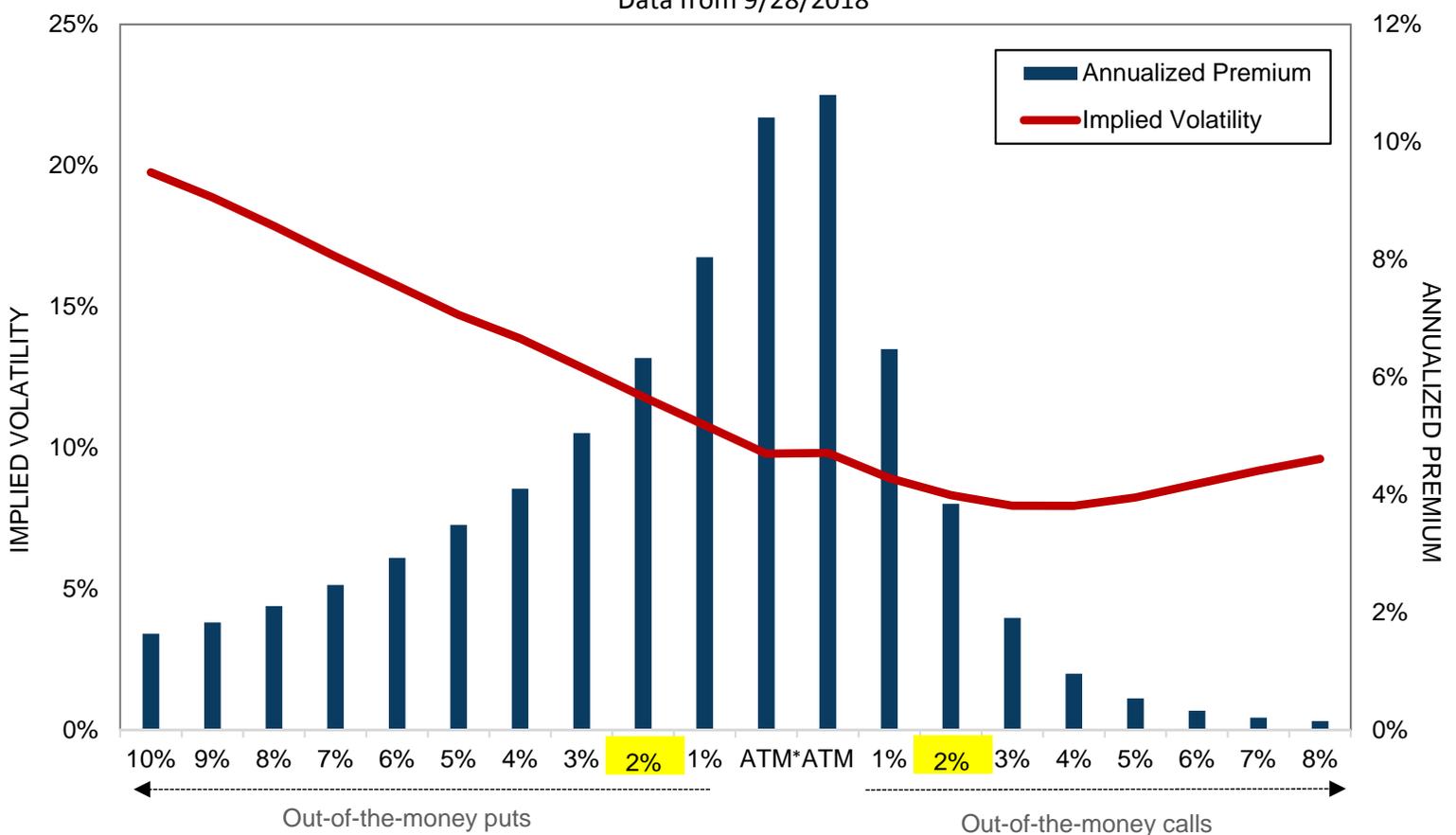
¹ The SKEW Index uses S&P 500® Index options pricing data to determine cost of protection (via an index put option) from a negative outlier return, i.e. a one-month loss of two standard deviations or more below the average monthly return of the Index, relative to the cost of upside leverage (via an index call option) to a positive outlier return. A higher SKEW reading indicates the option market has priced in a higher probability of a negative 'tail event,' or return that would fall in the extreme left tail of a distribution of monthly returns for the Index. For example, according to a Cboe® Frequently Asked Question document, a SKEW reading of 145 indicates more than a 14% probability of a negative two-standard-deviation event.

² The S&P 500® Index options market has a mixed record of registering high SKEW readings prior to large market losses. On 6/21/1990 SKEW reached a then-all-time-high of 142.57 and the S&P 500® Index subsequently declined over 19% from 7/16/1990 to 10/11/1990. On the other hand, SKEW set a new all-time high of 146.22 on 10/16/1998, which was weeks *after* the S&P 500® Index had a decline of over 19% from 7/17/1998 to 8/31/1998 and the market continued to rally and recover after SKEW had spiked. Conversely, SKEW was well below all-time highs prior to and throughout the August 2000 to October 2002 bear market associated with the technology bubble and was also well below all-time highs prior to and throughout the financial crisis bear market from October 2007 to March 2009.

While there may be intuitive appeal in asserting a relationship between the growing duration of the current equity bull market and index option prices reflecting an increasing probability of a significant downside event, note that such a relationship did not show itself during the technology-led bull market that came to an end in 2000. That bull market run began in 1987 and SKEW did not exhibit a persistent upward trend over the course of the 1990s. Before offering any insight into what may be driving the current trend in SKEW, let's take a closer look at what SKEW actually measures.

SKEW is an aggregate measure of the implied volatility differential between S&P 500® Index call and put options of equivalent moneyness across a matrix of strike prices and expiration dates with a weighted-average time to expiration of 30 days. Exhibit 2 illustrates what the implied volatility differential looked like at the end of the quarter across a relatively small subset of index call and put option contracts that go into the calculation of SKEW.³

Exhibit 2: S&P 500® Index Put and Call Options: Premiums and Implied Volatility Price
Component
 Data from 9/28/2018



*ATM is at-the-money
 Source: Bloomberg L.P. and Morningstar DirectSM

³ For a complete explanation of calculating SKEW see *The Cboe Skew Index – SKEW*, 2010 posted at www.cboe.com

As Exhibit 2 shows, the 2% out-of-the-money (OTM) put option has a higher premium than the 2% OTM call option due to the higher implied volatility component (red line) of the put option's price. Higher implied volatility is also priced into the 1% OTM put relative to the 1% OTM call, and the same relationship exists for the 3% OTM options, and so on. The calculation methodology behind SKEW measures and aggregates this differential across multiple S&P 500® Index option contracts. Graphical representation of implied volatility across strike prices, i.e. the red line in Exhibit 2, is commonly referred to as the 'volatility smile,' or more accurately, the 'volatility smirk' as the put side typically rises higher than the call side. This relationship is persistent over time and part of the reason why the SKEW Index has historically always had a reading above 100.

Thus, we see that SKEW is a measure of put prices *relative to* call prices. High SKEW does not necessarily mean that put option prices are high, or 'expensive,' on an absolute basis. Investors can better assess the cost of put options by observing put option prices directly or by observing the Cboe® Volatility Index (VIX®) since the implied volatility measured by the VIX® is typically the largest price component of shorter-term options.

Additionally, the VIX® levels over the period in which SKEW has been rising may provide some insight as to why this trend in SKEW exists. Since VIX® levels have been well below average on a persistent basis the past several years, put prices have been low relative to time periods of elevated VIX® levels. Importantly, put options purchased for relatively low premiums in low volatility periods potentially offer better protection characteristics than higher priced put options purchased in higher volatility periods. This is due to the propensity of implied volatility to increase as the market declines. As implied volatility increases it boosts put option prices, thus providing a component of the downside cushion puts provide. Lower implied volatility levels create the potential for larger increases in implied volatility when the market declines and, therefore, a bigger boost to put option prices. Because of this, investors may conclude that index put options have a better value proposition relative to other hedges in a low volatility environment than they do when volatility is persistently average or higher. Moreover, in an environment of low to rising interest rates, investors seeking downside protection may find the risk mitigation characteristics of high-quality bonds a poor value proposition given their indirect pricing relationship with equities (i.e. a decline in equity prices won't necessarily cause a price increase in bonds) and the increased potential for bonds to generate losses should interest rates rise. In short, increased demand for put options due to relatively low prices and a substitution effect may be contributing to the upward trend in SKEW.

We believe the features of index option markets and volatility measures like SKEW and VIX[®] create tools that are best suited for the strategic reduction of risk and enhancement of risk-adjusted return rather than making tactical bets on market direction or changes in volatility level. Investors interested in downside protection, but wishing to avoid undesirable aspects of high-quality fixed income in a low to rising interest rate environment, may find strategies that seek to reduce risk with index options appealing.