Assessing Option Demand from Signed Volume Order Flow

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Supply and demand in option markets matter. A critical assumption of popular pricing models such as Black-Scholes is that investors are subject to a no-arbitrage constraint, which implies a perfect elasticity of supply. In reality, a market maker will not provide endless options contracts without charging higher prices. This demand theory of option pricing is a crucial piece in understanding the behavior of implied volatility surfaces.

In the past, quantifying demand has not been straightforward. Standard option volume numbers are not fully reflective of option demand, because it is unclear whether volume was initiated by an option buyer or seller. OptionMetrics bridges this gap with the creation of the IvyDB Signed Volume Dataset. Utilizing the Lee and Ready algorithm (1991), direction is inferred by identifying where trades occurred in relation to the spread. Trades are classified such that those closer to the current ask price are treated as buy orders, and those closer to the current bid as sell orders.

This unique dataset provides key insights into market flow and participant activity. A prime example is the influence of demand on the implied volatility (IV) skew in index options. The IV skew describes a surface where out-of-the-money (OTM) options have larger IVs than at-the-money (ATM) options. Bollen and Whaley (2004) demonstrate that net demand for options directly affects their prices. In particular, there is a large institutional demand for OTM puts as a form of portfolio tail risk protection, leading to higher quoted vols relative to ATM options, which exerts an impact on the IV surface.

Order flow in these options can be used to help understand the failure of tail hedging strategies in 2018. That December, the S&P 500 plummeted more than -9%, however funds composing the Eurekahedge Tail Risk Index only managed to compensate investors with a measly 1.6% return. Structural hedging strategies such as protective puts yielded subpar returns due to a relatively stable skew for a majority of the month, even as market conditions continued to deteriorate through the end of the year. This counterintuitive result can be partially attributed to the lack of institutional demand for puts.

Figure 1 displays the SPX Buy Ratio for OTM Puts. This is calculated daily as the ratio of OTM put volume executed at ask divided by total OTM put volume. This ratio has an average of 33%, indicating typically one-third of put volume is in the form of buy orders.

The indicator demonstrates that since early December, put demand actually became smaller in the face of worsening market conditions, decreasing well below its average value (indicated by the red arrow). This suggests that investors had not dramatically increased their tail protection during this period, which created a significant drag on hedges already in place as a result of falling premiums, measured by SPX skew in Figure 2.

On December 26, the buy ratio spiked to over 50%, the largest in the sample on a day when the SPX snapped back nearly 5% (indicated by the black arrow). However, the skew continued to rise, even during the face of falling put demand and mild market returns (green arrow). Viewed simultaneously, these gauges show a large unwinding of OTM put positions from the Dec 26 buildup, suggesting put insurance had become overpriced. This timeline provides some clues into the story of failed hedges: put protection had delivered positive returns under unusual circumstances (Dec 26), and then the window for profit realization was very short.

Figure 1

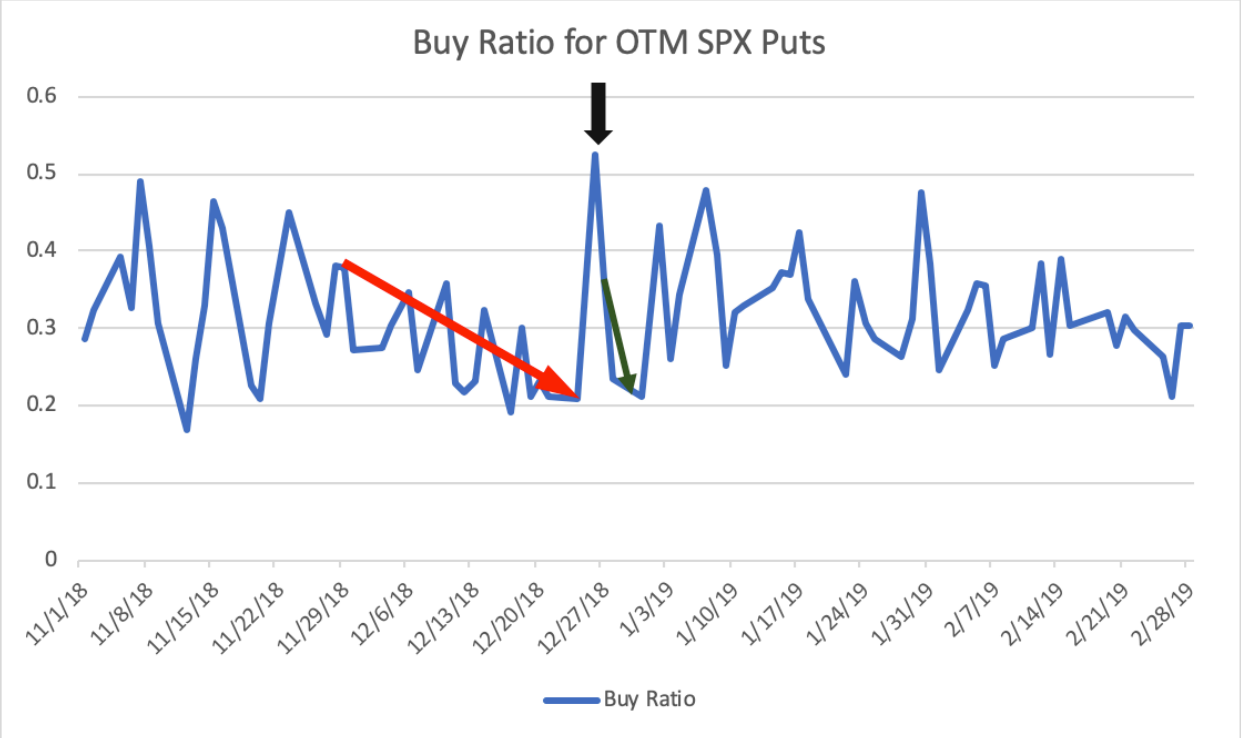
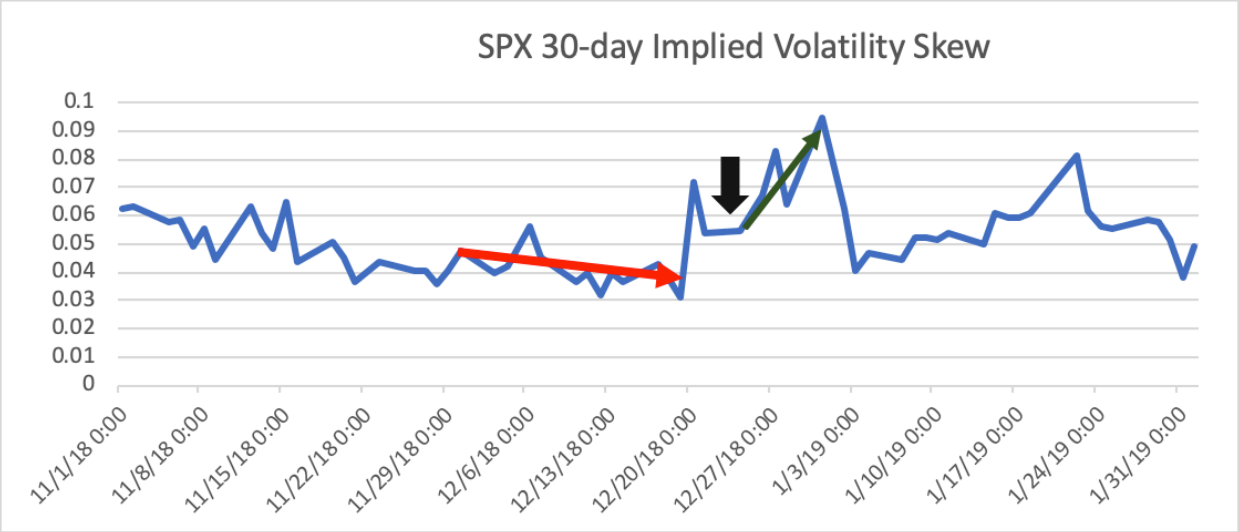


Figure 2



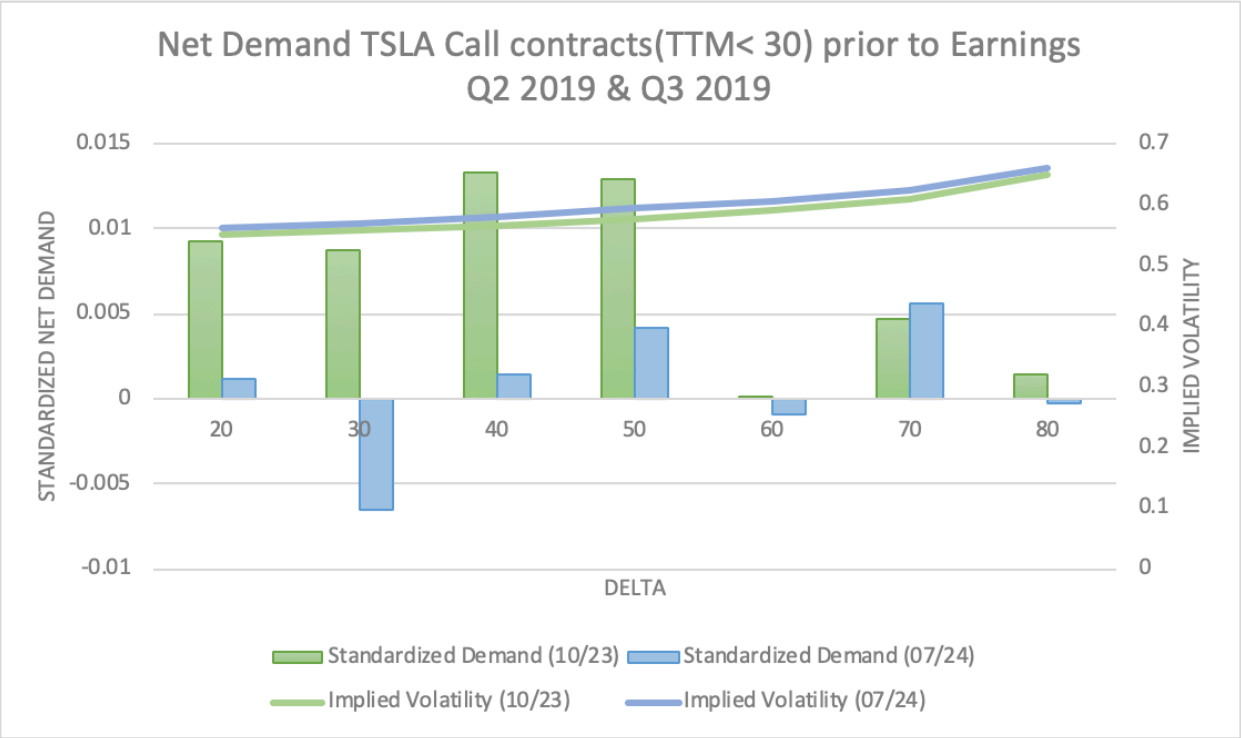
Demand inferred from order flow can also provide valuable insights into the performance of single name securities. In contrast to index options, demand pressure for firm stock options is concentrated in OTM calls, which explains differing implied volatility functions (Bollen and Whaley, 2004).

This insight can be applied to directional trading and sentiment prior to major corporate announcements, such as earnings. In Figure 3, option trading patterns are compared between separate Tesla earnings announcements, which had very different market reactions. Options trades are categorized by delta, then in each delta bin net demand is calculated as the difference between buyer- and seller-initiated contracts. Net demand is standardized by dividing by total volume.

The next day return performance for TSLA was substantially different between the Q2 and Q3 earnings, at -13.6% and 17.6%, respectively. The strong post-announcement returns realized 10/24 were preceded by significant net call buying in OTM options, relative to the weak buying ahead of Q2 earnings. This is relevant because OTM call strikes are the preferred habit of informed traders compared to ITM, due to their higher leverage. For the latter earnings, options traders were positioned significantly more bullish ahead of positive news.

While net flows should not be considered in isolation, they should be utilized as a valuable input into a systematic strategy or a signal for discretionary managers. Other applications of signed volume include stock selection in trend-following strategies or integration into demand-based volatility models.

Figure 3



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SOURCES:

Bollen, Nicolas PB, and Robert E. Whaley. "Does net buying pressure affect the shape of implied volatility functions?" *The Journal of Finance* 59, no. 2 (2004): 711-753.

Lee, Charles MC, and Mark J. Ready. "Inferring trade direction from intraday data." *The Journal of Finance* 46, no. 2 (1991): 733-746.