Volatility in Crude Oil Markets: Trading and Risk Management

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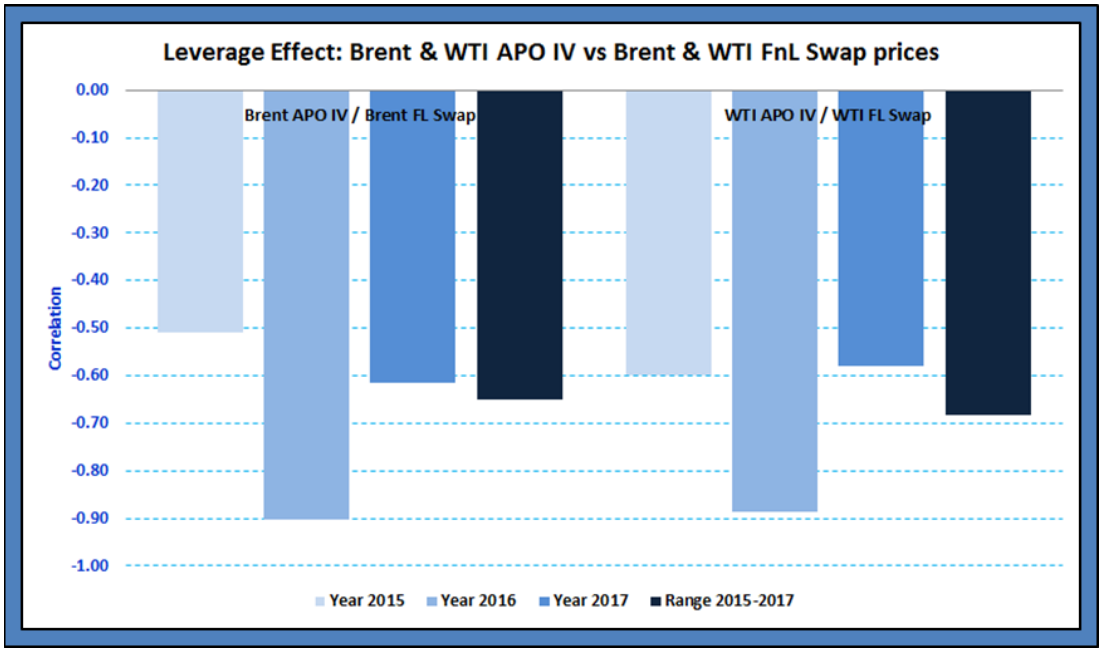
Volatility is the other name of market risk. Hedging against unwanted market fluctuations has always been one of the key topics in the commodities business, and in particular, within the energy industry. Crude oil producers, refiners, shipping and transportation companies are all concerned about how to limit their exposure to unwelcome price oscillations in order to lock into profitable refining margins, have steadier cash flows (and consequently higher P/E ratios), limit costs and have a more stable business model.

Whether market participants want to trade speculatively or they are interested in hedging their physical exposure, it does not really matter. All of them are affected by price volatility and they must manage it. Two key facts about volatility are as follows: 1) volatility is asymmetric, and 2) volatility is mean reverting.

Let's start by examining the first feature: asymmetric volatility. Asymmetry means that volatility will tend to behave in a certain way if the Brent or the West Texas Intermediate (WTI) market moves down, but it will behave in a different way should crude oil prices trend up. Clearly, the practical implications of such a relationship can be applied to both hedging and trading strategies and therefore it is important to quantify it.

As shown on Figure 1 on the next page, over the last two years the correlation between Brent Frontline (FL) swap prices and Brent implied volatility (IV), extracted from Brent average price option (APO) premiums, has clearly been negative. Specifically, it was negative 0.50 in 2015; it achieved negative 0.90 in 2016; and it was negative 0.61 in 2017 while it averaged negative 0.65 between 2015 and 2017. The same relationship was identified in the WTI Crude market (WTI Frontline swap prices vs WTI implied volatility extracted from WTI average price option premiums) where the correlation was minus 0.59 in 2015, negative 0.88 in 2016, and negative 0.58 in 2017 while it averaged negative 0.68 throughout the aforementioned two-year period. The negative link between implied volatility and swap prices is a consequence of the propensity of market participants to hedge against price retracements using options. The buying pressure on put options tends to lift the put skew rather quickly which, in turn, causes the implied volatility to increase.

Figure 1



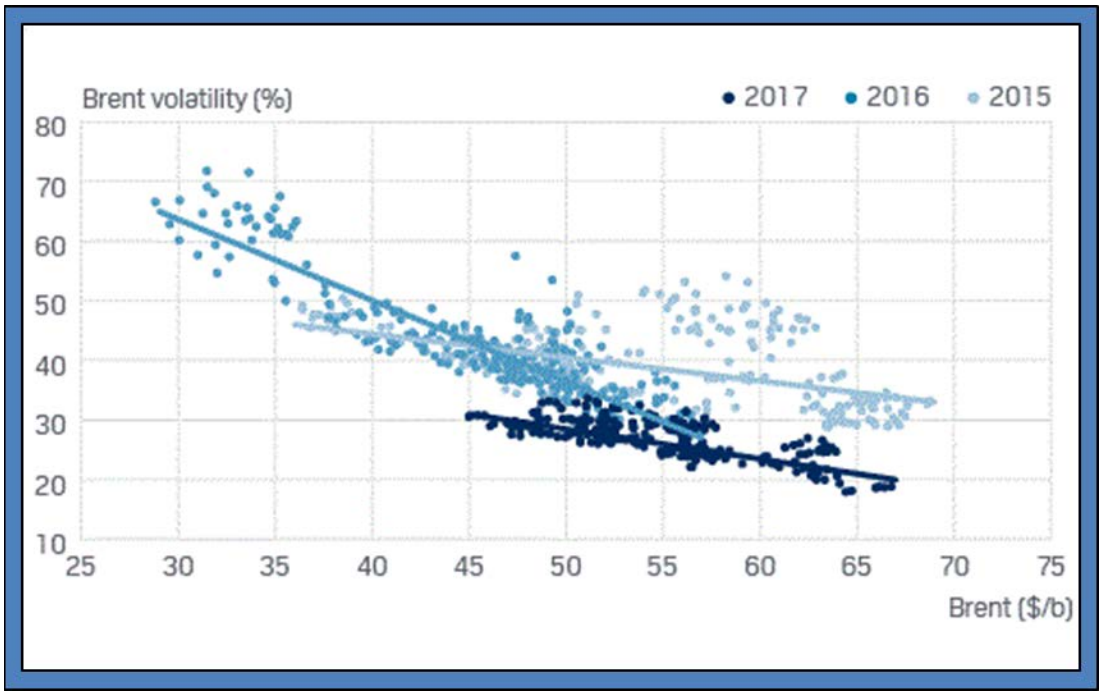
Source: S&P Global Platts Analytics.

Abbreviations: APO stands for Average Price Option; IV stands for implied volatility; and FnL and FL stand for Frontline.

Things are different when the market experiences an uptrend and prices tend to move up.

Figure 2's scatter plot on the next page shows rather clearly the leverage effect process between prices and implied volatility. When Brent prices, on the x axis, go down, the implied volatility, y axis, inevitably moves up. Conversely, a market uptrend is usually accompanied by a decreasing implied volatility. The regression lines visually show the perfectly linear relationship between prices and implied volatility. If there were a direct, rectilinear rapport between the two factors, all the observations would be neatly clustered and almost evenly dispersed around them. Consequently, the higher the divergence from the fit line is, the less efficient a hedging or trading strategy will tend to be. It is worth pointing out that in the oil business in particular, such sharp and short-lived divergences are by no means rare, due to geopolitical risk or crude supply shocks.

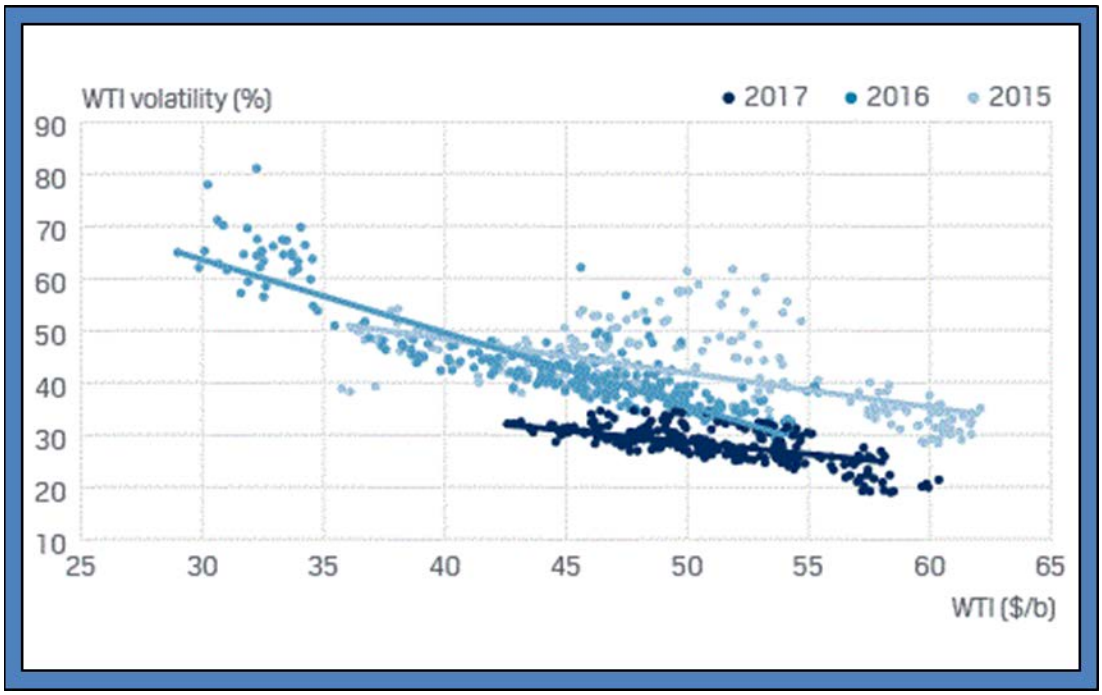
Figure 2
Brent Leverage Effect



Source: S&P Global Platts Analytics.

The same relationship is also identified in the American WTI crude market over the 2015-2017 period, as shown on Figure 3 on the next page.

Figure 3
WTI Leverage Effect



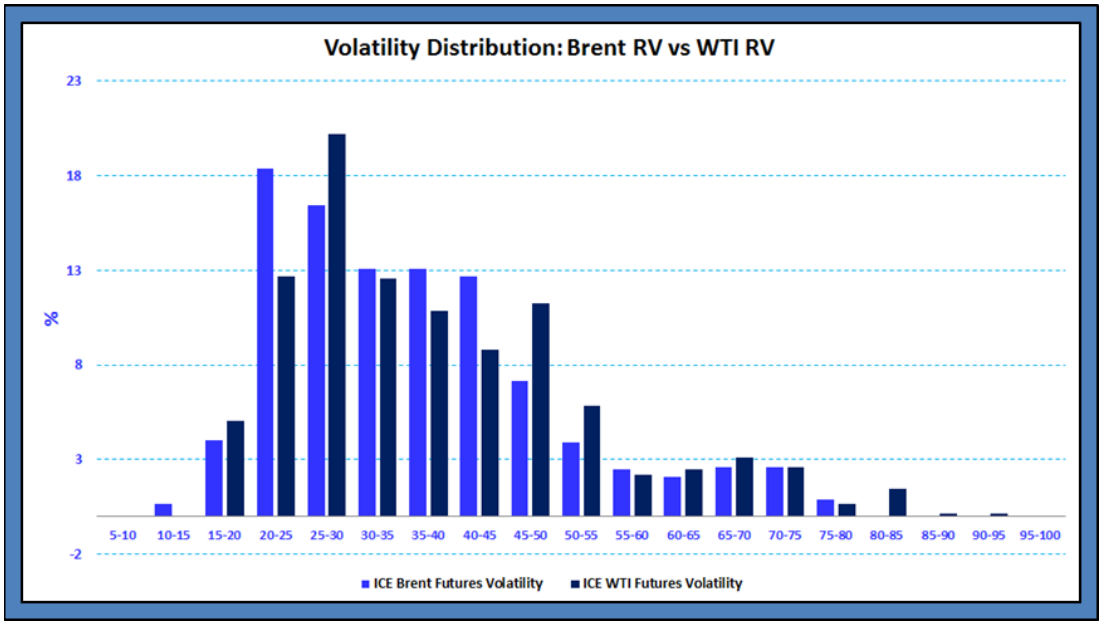
Source: S&P Global Platts Analytics.

It is important to point out that part of the reason why implied volatility moves inversely to prices is due to the speed with which the market trends. Crude oil prices tend to crash a lot more quickly than they uptrend, and this phenomenon has a clear impact on the fluctuation rate of the market. Furthermore, the higher speed with which the market downtrends incentivizes many speculators to place trades in order to realize quick profits with their behavior inevitably exacerbating the jump in volatility.

The second important feature of volatility is its propensity to mean reversion.

Figure 4 on the next page documents the distribution in realized volatility (RV) from 2015 through 2017 in Brent and WTI futures prices. Both Brent and WTI realized volatilities, on average, fluctuated between 20% and 30%. The mean-reversion propensity of volatility can be observed by the fact that the fluctuation rate for both crude grades was lower than 20% and higher than 50% less than 5% of the times. Furthermore, it is interesting to note that Brent and WTI volatilities fluctuate in a different way: WTI tends to be more volatile than Brent. Specifically, Brent's equilibrium level is within the 20%-25% range while WTI's is 25%-30%. Also, the probability of volatility trading above 45% is higher for WTI than it is for Brent, implying that the American crude market's fluctuation rate spikes more often than that of the European grade. The volatility distribution analysis can provide a map for crude oil market risk because it can help in identifying the turning points in the market.

Figure 4

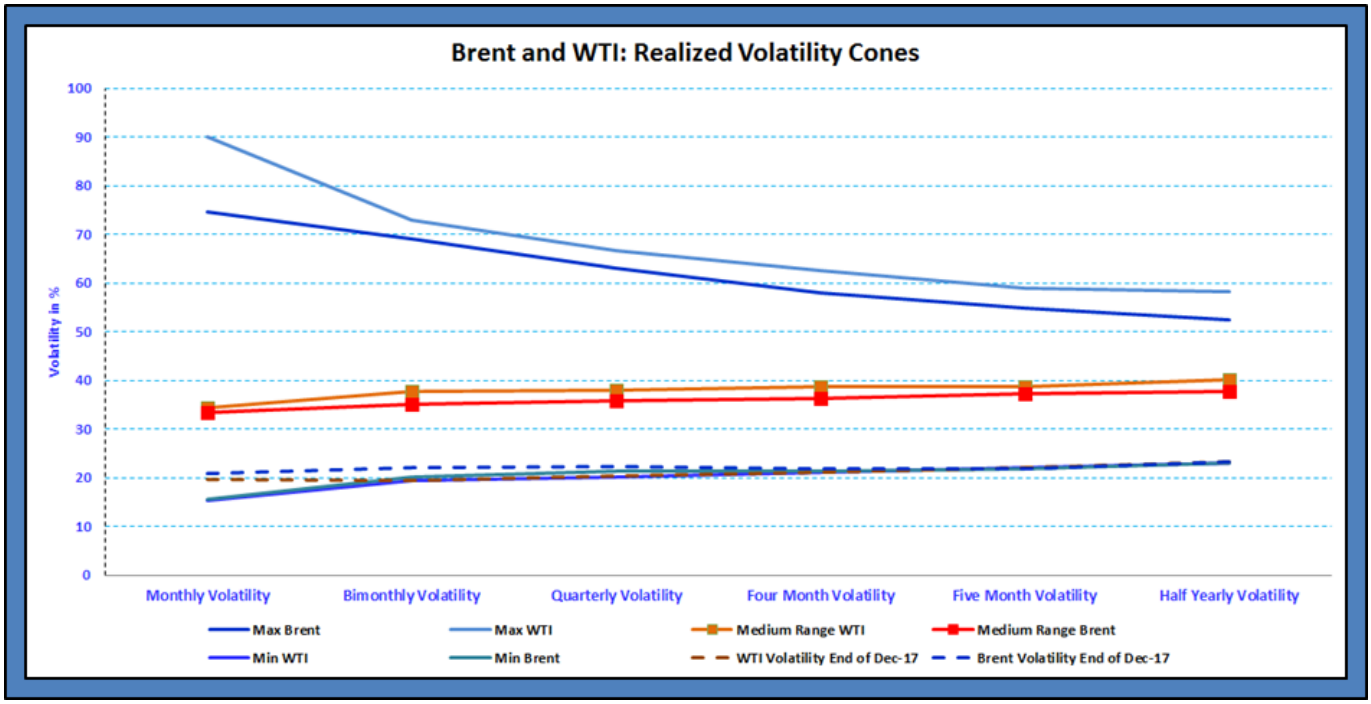


Source: S&P Global Platts Analytics.

Abbreviation: RV stands for realized volatility; and ICE stands for the Intercontinental Exchange.

A volatility cone analysis, such as in Figure 5 on the next page, is a valuable tool to historically contextualize the actual fluctuation rate. It effectively helps to understand whether current volatility is low or high compared to its distribution over a certain period of time (in this case from 2015 to 2017). The WTI and Brent volatility curves (dotted lines) that have been computed using prices as of December 2017 are seen to be near their lowest levels in two years, indicating at the time that options would be regarded as cheap.

Figure 5



Source: S&P Global Platts Analytics.

Concluding Remarks

The mean-reversion propensity of volatility and its asymmetric movement are important factors that market participants should use when designing hedges for their market exposure as well as to identify trading opportunities using options.

Endnotes

All examples in this report are hypothetical interpretations of situations and are used for explanation purposes only. The views in this report reflect solely those of the author and not necessarily those of S&P Global Platts or its affiliated institutions. This report and the information herein should not be considered investment advice or the results of actual market experience.

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Mr. Vito Turitto joined the S&P Global Platts Commodity Risk Solutions team in 2015. Prior to joining Platts, he started his career in the City of London trading options on crude oil and other energy markets and went on to build HyperVolatility Ltd, a boutique quantitative investment consultancy. Mr. Turitto's field of expertise is in volatility trading, analysis and modeling. Mr. Turitto holds a B.A. in International Economics Relations from the University of Rome "La Sapienza" and received his Master of Science in International Finance and Investment from London South Bank University after completing a dissertation on forecasting volatility in the American crude oil market via stochastic volatility models.