National Stock Exchange Of India Limited

Department : Commodity Derivatives Segment	
Download Ref No: NSE/COM/45563	Date : September 02, 2020
Circular Ref. No: 32/2020	

All Members,

Handling of Negative Strike price in Options contracts

In continuation to Exchange circular reference number 44612 dated June 10, 2020 regarding handling of negative price in Brent Crude (BRCRUDE) contracts in Commodity Derivative Segment, Members are requested to note below changes for all option in goods contracts:

1. In case of downward price movement for underlying commodity, Exchange may introduce negative strike price of the respective contracts as and when necessary.

2. Computation of Theoretical base price at the time of introduction of the contract shall be done as per below models:

Sr. No.	Particulars	Model
1.	If Strike Price is equal to or less than zero (0)	Bachelier Model
2.	If Strike Price is greater than zero (0) and underlying price is equal to or less than zero (0)	Bachelier Model
3.	In all other cases, if Strike Price is greater than zero (0)	Black & Scholes Model

3. Kindly refer the Annexure - 1 for more details on the computation for the above-mentioned models.

The aforesaid changes shall be effective w.e.f. September 07, 2020.

For and on behalf of
National Stock Exchange of India Limited

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Annexure - 1

Base Price Computation	Calculation of Theoretical base price of contracts as per Black Scholes model	Calculation of theoretical base price of contracts as per Bachelier Model
Call Option	C = S * N (d1) - X * e ^ (- rt) * N (d2)	C = S*N (d1) - X*e^(- rT)*N(d1) + σ*$\sqrt{T}$*n(d1)
Put Option	P = X * e ^ (- rt) * N (-d2) - S * N (-d1)	P = X*e^(- rT)*N(-d1) - S*N (-d1) + σ*$\sqrt{T}$*n(d1)
Parameters	Where: d1 = [(ln (S / X) + (r + s ^ 2 / 2) * t)] / (s*√t) d2 = [(ln (S / X) + (r – s ^ 2 / 2) * t)] / (s*√t) d2 = d1 - s*√t and C = price of a call option P = price of a put option S = price of the underlying asset X = Strike price of the option r = rate of interest (Rate of interest shall be the relevant MIBOR rate for the day) t = time to expiration s = volatility (Volatility shall be the higher of the underlying volatility or the near month futures contact volatility on the relevant day.) N represents a standard normal distribution with mean = 0 and standard deviation = 1, and ln represents the natural logarithm of a number. Natural logarithms are based on the constant e (2.71828182845904).	Where, d1 = $\frac{S - X}{\sigma\sqrt{T}}$ C = Call premium P = Put premium S = Spot Price X = Strike Price r = rate of interest (Rate of interest shall be the relevant MIBOR rate for the day) T = Time to expiry in years either Strike price or underlying price is '0' or negative value. N(d1) = Cumulative standard normal distribution n(d1) = Standard Probability density function σ = Underlying volatility arrived at using EMWA model as below, [√ (0.94 *(previous Daily σ) ^ 2 + 0.06 * (today's close – previous close) ^2)] * √365