

# Black Scholes Pricing

An overview of how Lyra converges to the fair market price for options

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Lyra's pricing mechanism is **centred around an AMM for implied volatility** (IV), which yields the key input for the Black Scholes equation. We will discuss this at a high level here, with the detailed version described in the [whitepaper](#).

## Initialization

The Lyra community will initialize the baseline IV level for each expiry when the options are listed. Along with IV, the volatility ratio per strike/expiry combination is initialized. These values will be determined by current market conditions with guardrails in place to ensure reasonable parameters are initialized.

## Standard Size

From then on, the AMM will increase and decrease the IV for an expiry based on the supply/demand for options within that expiry. The magnitude of change from a given trade is contextualized using the notion of a **standard size**. The standard size for a round is defined as the number of contracts a trader would have to buy (sell) for the AMM to increase (decrease) the baseline IV level for an expiry by one percentage point. This is the mechanism which allows the AMM to find an equilibrium level for IV.

## Strike Volatility Ratios

Lyra also captures the effects of realized volatility smiles by **adjusting the volatilities for each strike based on supply/demand**. For each *standard size* bought (sold) per strike/expiry combination, the Lyra

AMM will increase (decrease) the ratio of that strike's volatility to the baseline IV by a constant determined at the time of listing.

## Dynamic Volatility Input

When a trader requests a trade, the AMM determines how large the trade is in terms of standard sizes. It then impacts the baseline IV and strike volatility ratios for the relevant expiry/strike combination. **The multiplication of the impacted baseline IV and the strike volatility ratio yields the volatility input to the Black Scholes equation.**

**Example:** The standard size is 10 contracts, the baseline IV for July is 100%, the strike volatility ratio for the ETH 2500 strike is 1.1, and the skew impact parameter is set to 0.005. If a trader comes to buy 20 ETH July 2500 calls, the AMM will increase IV to 102%, and the strike volatility ratio to  $1.1 + 0.005 * 2 = 1.11$ . These values combine to give us the IV input for the trade:  $1.11 * 102\% = 113.22\%$ .