

## Implied Volatility Tool

Implied volatility tool helps users to derive implied volatility surface from option prices. It is very useful for traders and investors. The volatility derivation is based market option model. Given an option price, the model can calculate implied volatility.

The term structures of implied volatilities which provide indications of the market's near- and long-term uncertainty about future short- and long-term swap rates. A crucial property of the implied volatility surface is the absence of arbitrage.

Volatility skew or smile pattern is directly related to the conditional non-normality of the underlying return risk-neutral distribution. In particular, a smile reflects fat tails in the return distribution whereas a skew indicates return distribution asymmetry.

To construct a reliable volatility surface, it is necessarily to apply robust interpolation methods to a set of discrete volatility data. Arbitrage free conditions may be implicitly or explicitly embedded in the procedure. Typical approaches are

Any volatility models must meet arbitrage free conditions, such as static arbitrage free condition, calendar arbitrage free condition, vertical (spread) arbitrage free condition, horizontal (butterfly) arbitrage free condition.

Static arbitrage free condition makes it impossible to invest nothing today and receive positive return tomorrow. Calendar arbitrage free condition is the cost of a calendar spread should be positive.

Vertical (spread) arbitrage free condition is the cost of a vertical spread should be positive. Horizontal (butterfly) arbitrage free condition is the cost of a butterfly spread should be positive.

References:

<https://finpricing.com/lib/ToolEqVol.html>