Cap Volatility Surface

An implied volatility is the volatility implied by the market price of an option based on the Black-Scholes option pricing model. In cap market, a cap/floor is quoted by implied volatilities but not prices. An interest rate cap volatility surface is a three-dimensional plot of the implied volatility of a cap as a function of strike and maturity.

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

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Vol skew or smile pattern is directly related to the conditional non-normality of the underlying returns. In particular, a smile reflects fat tails in the return distribution whereas a skew indicates asymmetry. A crucial property of the implied volatility surface is the absence of arbitrage.

We present a method for generating a term structure of at-the-money implied volatilities from Black-Scholes call/pub option prices.

We calibrate the price process against the market price of various European style call/pub. Based on the calibrated process above we generate, for each required maturity point, the price of an at-the-money, European style call/pub option; we then derive the constant Black-Scholes volatility that corresponds to this option price.

We estimate the implied volatility surface, defined as the Black's implied volatility with respect to varying strike and maturity and computes the Black's implied term volatility level corresponding to a given strike and maturity date pair, based on a corresponding implied term volatility surface defined using the function.

Reference:

https://finpricing.com/lib/FiBondCoupon.html