Precious Metal Implied Volatility

Precious metals are trading commodities. But a precious metal quote is very similar to a Forex quote. The quote is represented in the same way as a quote for a currency pair. For instance, the spot gold traded against the US dollar is XAU/USD.

An implied volatility is the volatility implied by the market price of an option based on the Black-Scholes option pricing model. A volatility surface is derived from quoted volatilities that provides a way to interpolate an implied volatility at any strike and maturity.

Unlike in other markets that quote volatility versus strike directly, the precious metal or FX smile is given implicitly as a set of restrictions implied by market instruments and as such a calibration procedure to construct a volatility- delta or volatility-strike smile is used.

In the past, precious metals were the foremost commodity-based form of payments. The use of precious metals as currency led to the production of coinage that was used as trading devices. The institution of coinage further led to the development of representative currencies in the form of notes.

Later on, major world currencies were pegged to the value of gold. After the collapse of the Breton Woods agreement, precious metals are no longer used as a primary mode of monetary transactions. But they continuous to share a close relationship with established currencies.

Spot precious metal prices are quoted in USD per troy ounce. Thus, a quote of XAU/USD 1000 means 1oz of gold is equal to $1000 USD.

An implied volatility is the volatility implied by the market price of an option based on the Black-Scholes option pricing model. A precious metal volatility surface is a three-dimensional plot of the implied volatility as a function of term and Delta and smile.

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The volatility surface in precious metal market is constructed based on the sticky delta rule. The underlying assumption is that options are valued depending on their delta, so that when the precious metal spot rate moves and the delta of an option changes accordingly, a different implied volatility has to be used into the pricing formula.

Therefore, precious metal volatility smile is represented by three entities: at-the-money (ATM) volatility, risk reversal, and butterfly. The standard market quotes are ATM level, 10 delta risk reversal, 10 delta butterfly, 25 delta risk reversal, and 25 delta butterfly.

Reference:
https://finpricing.com/lib/EqVariance.html