Skew Stickiness Ratio (SSR)

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1 Skew Stickiness Ratio (SSR)

1.1 Definition

The *Skew Stickiness Ratio (SSR)* measures how the implied-volatility skew changes when the underlying spot price moves. It quantifies how much of the skew movement is driven by the spot itself, versus how much remains fixed.

Let $\sigma(K, T)$ be the implied volatility surface. When the spot price moves from S to $S + dS$, the SSR is defined as:

$$SSR = \frac{\partial \sigma / \partial S}{\partial \sigma / \partial K}.$$

The numerator represents the change in implied volatility caused directly by the spot move, while the denominator represents the slope of the skew as a function of strike (i.e., moneyness effects).

1.2 Interpretation

The SSR describes where the market lies between the two classical surface dynamics assumptions:

- **Sticky-Strike**: implied volatilities at each strike remain unchanged when spot moves.
- **Sticky-Delta**: implied volatilities shift to maintain the same deltas, moving in sync with the spot.

Typical values and behaviors:

SSR Value	**Interpretation**	**Behavior**
0	Pure sticky-strike	Vol does not move with spot
1	Pure sticky-delta	Vol moves fully with spot
$0 < SSR < 1$	Mixed behavior	Typical market behavior
$SSR < 0$ or $SSR > 1$	Overreaction / inversion	Stress regimes

1.3 Importance

The SSR is important in practice because:

- It controls the **dynamics** of the implied volatility surface.
- It strongly affects pricing and hedging of **barrier** and **digital** options, which depend on the correlation between spot and smile dynamics.
- It is essential for correctly specifying smile dynamics in **stochastic volatility** and **local volatility** models.
- It impacts risk management and P&L through **smile dynamics**.

1.4 Numerical Example

Suppose:

- ATM volatility is 20%,
- The downward skew slope is -3% per 10% of moneyness,
- The spot increases by 2%,
- ATM volatility increases by 0.1% in response.

Then,

$$SSR = \frac{0.1\%}{(3\%/10\%) \cdot 2\%} \approx 0.17.$$

This means the skew is approximately 17% sticky-delta and 83% sticky-strike, which is typical for equity markets.