PRACTICE OF HEDGING

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Jargon of the Market

1. **In the money:** An option is described as being in the money when the current price of the underlying is above the strike or exercise price for a call, and below the strike price for a put. Options can also be described as being deep in the money when they are likely to expire in the money.
2. **At the money** An option is described as being at the money when the exercise price is approximately the same as the underlying price. 'At the money' options may also be either in or out of the money.
3. **Out of the money** An option is described as being out of the money when the current price of the underlying is below the strike or exercise price for a call, and above the strike price for a put. Options can also be described as being deep out of the money when they are likely to expire out of the money.
4. **Stop loss order** A stop loss order is a limit order to buy or sell which operates only when a given price is reached. Such an order is normally placed to cut losses on an existing position. Once the stop loss level is reached, the order is often executed at the next market price (particularly in volatile markets).
5. **Plain Vanilla** A Plain Vanilla instrument is a standard financial or derivative instrument without special features. A plain vanilla call is a European call option.
6. **Sensitivity** Sometimes the Greeks are called sensitivities in respect to the different parameters. Sensitivity is the degree to which changes in one variable cause changes in another variable.
7. **Bank book** It contains debit and credit items such as loans and deposits from customers including other banks.
8. **Trading book** It contains all trades in proprietary position in financial instruments.

- RISK
  - Tools to measure risk : THE GREEKS
- HEDGING
- MICRO-MANAGEMENT
- MACRO-MANAGEMENT

BLACK-SCHOLES …….

- **Assumptions**

  - **Ito Process**: It is characterized by a random component that is independent and identically distributed. Its principal characteristic is that it needs to be memoryless.
  - **Frictionless Markets**: There are no transaction costs, no costs of adjustment, any stamp tax, or exchange controls. This means that the operator can buy and sell in large quantities to adjust the delta which leads to the total absence of the impact of the utility functions. The existence of the transaction costs would obviously change the argument for the hedging policy of an isolated operator.
  - **Constant Volatility**: This means that the daily variations are drawn from the same distribution and that the variance is known. This leads to constant correlation between different assets.
  - **Geometric Brownian motion**: This means that the motion of the assets is “geometric”- that the expected variance of the logarithms of the returns remains constant.
  - **Constant and Known Drift**: This means that the structure of the forwards slope is constant.

Contd…….

- **Market Corrections :**
  - **Assumption 1:** needs to be lifted in case of serious path dependency, particularly if the manufacturing of the option might impact the path of the underlying asset.
  - **Assumption 2:** means that the traders cannot adjust their delta every micro tick change of the price of the underlying. This means that the delta needs to be computed discretely.
  - **Assumption 3:** Volatility is very unstable and this leads to the delta to lose its quality of hedge ratio and the gamma its predictability of changes in delta.
  - **Assumption 4:** The distribution can be thought of to be arithmetic instead of geometric.
  - **Assumption 5:** The rate of drift actually moves and is often correlated with the movement in the asset prices and the drift does not move in parallel, but in a predictable manner.

Greeks

- **Delta**
  - Shortcomings
  - The continuous time hedging is not used in practice.
  - The delta does not operate on a portfolio of options that mixes longs and shorts. It is an extremely weak measure of risks.
  - Modifications
  - Use a discrete delta with increments.
  - Shadow delta adds some vegas and gammas to it.

- **Gamma**
  - Shortcomings
  - It is meaningless for a portfolio of options.
  - It does not take into account the changes in volatility when the market moves.
  - Modifications
  - Use a discrete gamma with increments which give us up gamma and down gamma.
  - Shadow gamma takes care of the volatility smile.
  - Skew gamma measures the impact of non-linear changes in volatility arising from an up or down moves.

Adapting Black-Scholes Model to the Market

Adapting the Delta:

- **Modified Delta =$\Delta F/\Delta U$**,

- **Delta = ½($\Delta F/\Delta U-$ + $\Delta F/\Delta U+$)**
  with $\Delta U+$ is the up-move in the underlying asset and $\Delta U-$ is the down move.

Adapting the Gamma:

- A practically sound way to measure the gamma is to vary the underlying price and calculate the actual change in hedge ratio over the increment. This operation needs to be performed twice:

1. To display the "up-gamma" by moving the price north and computing the change in delta.
2. To display the "down-gamma" by moving the price south and computing the change in delta.

- **Shadow Gamma**
- Shadow Gamma is the computation of the forecast changes in delta tacking into account the changes in volatility and its impact on the position. The position is then re-evaluated using new volatility parameters.