Derivatives - Hull

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Concepts

Maturity - The end of the life of a contract.
Short - Short position = Seller position
Long - Long position = Buyer position
Risk factor - Source of uncertainty.

- IR: Interest Rate
  - Yield Curves: Rate curves given by countries
  - Reference rate curves: EURIBOR, LIBOR, SOFR
  - CDS curves
- FX: Foreign Exchange. ex. EUR/USD
- Equity: ex. BNP equity.
- Commodities: ex. Oil price.

Spot Price - The price for immediate delivery. **OTC Market** - Over-the-counter. A market where traders deal directly with each other or through an interdealer broker. The traders are usually financial institutions, corporations, and fund managers.
Exchange-traded markets - A derivatives exchange is a market where individuals and companies trade standardized contracts that have been defined by the exchange. Contrary to OTC

Notation

S - Stock price, more generally underlying asset price.
Δ - Variation
t - Time
ϕ - Normal distribution
σ - Volatility
r - Interest rate
c,f - Price of option

Assets

Commodities

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Real State

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Intellectual properties

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Pollution emission rights

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Stocks

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Bonds

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Currencies

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Derivatives

A derivative involves two parties agreeing to a future transaction. Its value depends on (or derives from) the values of other underlying variables.

Forward contracts

- A contract that obligates the holder to buy or sell an asset for a predetermined delivery price at a predetermined future time.

Future contracts

- A contract that obligates the holder to buy or sell an asset at a predetermined delivery price during a specified future time period. The contract is settled daily.

Difference Forward and Future

- Future are traded in exchange markets whereas Forwards are OTC.

Options

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Swaps: Interest rate swap

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Swaps: Currency swap

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Swaps: CDS(Credit default swap)

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Swaps: Quanto

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Black and Scholles

Assumptions

- Stock price assumes that percentage changes in very short period of time are normally distributed.

$$\frac{\Delta S}{S} \backsim \phi(\mu\Delta t, \Delta t)$$

Equation

$$\frac{\partial f}{\partial t} + rS\frac{\partial f}{\partial S} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 f}{\partial S^2} = rf$$

Risk

Greeks or Risk sensitivities

Greek	Symbol	Measures	Definition
Delta	$\Delta = \frac{\partial c}{\partial S}$	Underlying variable (S) exposure	Change in option price due to spot
Gamma	$\Gamma = \frac{\partial^2 c}{\partial S^2}$	Underlying variable (S) convexity	Curvature of option price with respect to spot
Theta	$\Theta = \frac{\partial c}{\partial t}$	Time decay	Change in option price due to time passing
Vega	$\upsilon = \frac{\partial c}{\partial \sigma}$	Volatility exposure	Change in option price due to volatility
Rho	$\rho = \frac{\partial c}{\partial r}$	Interest rate exposure	Change in option price due to interest rates
Volga	$\frac{\partial^2 c}{\partial \sigma^2}$	Volatility convexity	Curvature of option price with respect to spot
Vanna	$\frac{\partial c}{\partial S \partial t}$		Change in Delta due to Volatility

VaR & ES

PnL