# Advanced Finance - Cheatsheet

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Version: May 16, 2025

## Terminology

**Derivatives**: Any financial instrument that is derived from another e.g. options, warrants, futures, swaps

**Option**: gives the holder the right to buy or sell a security at a specified price during a specified time period

**Call Option**: The right to buy a security at a specified price within a specified time

**Option Premium**: The price paid for the option, above the price of the underlying security

**Intrinsic Value**: Difference between the strike price and the stock price

**Time Premium**: Value of option above the intrinsic value

**Exercise Price**: (Strike Price) The price at which you uby or sell the security

**American Option**: Can be exercised at any time prior to and including the expiration date

**European Option**: Can be exercised only on the expiration date

**Exercise price** ↑: **Call Price** ↓, **Put Price** ↑

**Put Option**: The right to sell a security at a specified price within a specified time

**Butterfly**

**Straddle**

**Strategy of buying a call**: <span style="color:red">Bild einfügen</span>

**Value of company's assets** ↑, **Value of default put** ↓

**Std dev asset value** ↑, **Value of default put** ↑

**Amount of outstanding debt** ↑, **Value of default put** ↑

**Debt maturity** ↑, **Value of default put** ↑

**Default-free interest rate** ↑, **Value of default put** ↓

**Dividend payments** ↑, **Value of default put** ↑

## Formulas

### Put-Call-Parity

$$C + PV(EX) = P + S$$

where:

- $C$ = Price of the European call option
- $PV(EX)$ = Present value of the strike price = $\frac{Ex.Price}{(1+r)}$
- $P$ = Price of a European Put
- $S$ = Share Price

### Option $\Delta$

$$Option\Delta = \frac{C_u - C_d}{S_u - S_d} = \frac{P_u - P_d}{S_u - S_d}$$

where:

- $C_u$ = Call upside
- $C_d$ = Call downside
- $P$ = Put
- $S$ = Stock

### Risk neutral probability of rising value

$$p^* = \frac{(1+r) - d}{u - d}$$

where:

- $r$ = Interest rate
- $d$ = Relative downward change
- $u$ = Relative upward change

## Expected Value

$$ExpectedValue = (p^* * PayOff_u) + ([1 - p^*] * PayOff_d)$$

## Present Value

$$PresentValue = \frac{ExpectedValue}{(1+r)} = ValueShares - ValueLoan$$

$$ValueLoan = \frac{ValueShares_d}{(1+r)}$$

## Up and Down Changes

$$1 + UpsideChange = u = e^{\sigma * \sqrt{h}}$$

$$1 + DownsideChange = d = \frac{1}{u}$$

where:

- $\sigma$ = Standard Deviation
- $h$ = Fraction of Year

## Black-Scholes Formula(weg wenn zu viel)

$$C = (N[d_1] * S) - (N[d_2] * PV[EX])$$

$$d_1 = \frac{log(\frac{S}{PV[EX]]})}{\sigma * \sqrt{t}} + \frac{\sigma\sqrt{2}}{2}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

where:

- $C$ = Call Value
- $N[d]$ = Cummulative normal probability
- $PV(EX)$ = Ex. Price at risk-free interest rate
- $S$ = Stock price
- $t$ = number of periods tp exercise date
- $\sigma$ = Standard Deviation
- $if d_1 is large, N(d_1) is close to 1.0$
- $if d_1 is zero, N(d_1) is close to 0.5$

## Present Value Formlua BOND

$$PV = \sum_{t=1}^{T} \frac{cpn}{(1+r)^t} + \frac{par}{(1+r)^T}$$

$$PromisedYield = \frac{Payoff}{PV} - 1$$

where:

- $cpn$ = Coupon rate
- $r$ = Interest rate
- $T$ = Number of periods
- $par$ = Face value

## Take or Die

**Expansion Options**: Uncertainty ↑ - Valoue of exp. option ↑ **Value of a call (takeaways)**:

- Never worth more than the stock price itself.
- When the share is worthless, the option is worthless.
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## Binomial Method