

# Advanced Finance - Cheatsheet

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## 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 buy 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:** **Bild einfügen**

**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** ↑

**Indenture or trust deed:** The bond agreement between the borrower and a trust company

**Registered bond:** A bond in which the company's records show ownership and interest and principal are paid directly to each owner.

**Bearer bonds:** The bondholder must send in coupons to claim interest and must send a certificate to claim the final payment of principal

**Accrued interest:** The amount of accumulated interest since the last coupon payment

**Coupon:** Interest paid on a bond

**Debentures:** Long-term unsecured issues on debt

**Mortgage bond:** Long-term secured debt, often containing a claim against a specific building or property

**Collateral trust bonds:** Bonds secured by common stocks or other securities that are owned by the borrower

**Equipment trust certificate:** Secured debt generally used to finance railroad equipment. The trustee retains equipment ownership until the debt is repaid.

**Asset-backed securities:** The sale of cash flows derived directly from a specific set of bundled assets

**Mortgage-backed securities:** Package of mortgage loans sold; owners of package receive portion of mortgage payments

**Callable bond:** Allows the issuer to repay the debt, valuable to reduce leverage

**Puttable (retractable) bond:** Allows the investor to be repaid for the debt, A protective covenant for the investor

**Sinking fund:** A fund established to retire debt before maturity

**Bond covenants:** Debt ratios, Security, Dividends, Event risk, (+) working capital, (+) net worth

**Lease:** Rental agreement that involves fixed payments from lessee to lessor (*Reasons: convenient, provided maintenance, low cost through standardization, tax shields, financial distress, avoid capital expenditure controls, preserve capital off-balance sheet financing*)

**Direct Lease:** The lessor buys the equipment from the manufacturer

**Full Service Lease:** The lessor provides maintenance and insurance

**Operating Lease:** The initial lease period is shorter than

the economic life of the asset

**Financial Lease:** The initial lease period is long enough for the lessor to recover the cost of the asset

**Net Lease:** The lessee provides maintenance and insurance

**Leveraged Lease:** The lessor finances the lease contract by issuing debt and equity claims against it

**Sale and Leaseback:** The lessor buys the equipment from the prospective lessee

**Spot price:** Price paid for immediate delivery

**Forward vs futures contract:** Both contracts buy or sell at a specified future date at a specified price. However, compared to forwards, futures are traded on an exchange and they are marked to market. *Futures fixes a price which has to be paid if market value is higher or lower*

**Long vs short position:** Investors who are long have agreed to buy the asset. Investors who are short have contracted to sell.

**Basis risk:** The risk that arises because the price of the asset used to hedge is not perfectly correlated with that of the asset that is being hedged.

**Mark to market:** Profits and losses on a position are settled on a regular basis

**Net convenience yield:** The advantage from owning the commodity rather than the promise of future delivery less the cost of storing the commodity

**Exchange Rate:** Amount of one currency needed to buy one unit on another

**Spot Rate of Exchange:** Exchange rate for an immediate transaction

**Forward Exchange rate:** Exchange rate for a forward transaction

## 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)

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

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

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

where:

- $C$  = Call Value
- $N[d]$  = Cumulative normal probability
- $PV(EX)$  = Ex. Price at risk-free interest rate
- $S$  = Stock price
- $t$  = number of periods to 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 Formula 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

## Predicting Default: Altman's Z-score

$$Z = 1.2x_1 + 1.4x_2 + 3.3x_3 + 0.6x_4 + 1.0x_5$$

where:

- $x_1$  = working capital/total assets
- $x_2$  = retained earnings/total assets
- $x_3$  = earnings before interest and tax (EBIT)/total assets
- $x_4$  = market value of equity / total liabilities
- $x_5$  = sales/total assets

## Convertible Securities

$$ConversionPrice = \frac{FaceValue(1000\$)}{ConversionRatio}$$

$$ConversionValue = Conversionratio * shareprice$$

## Take or Die

**Expansion Options:** Uncertainty ↑ - Value 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.

## Lease or Buy

- Buy if equivalent annual cost of ownership and operation is less than the best lease rate
- For using extended periods, buying tends to be cheaper
- Leasing, because lessor might be able to manage asset at less expense than lessee
- Leasing has useful options in leasing agreement

$$NPV_{lease} = InitialFinancing - \sum_{t=1}^T \frac{LeaseCashFlow}{[1 + r_D * (1 - T_c)]^t}$$

$$NPV = PV_{EquivalentLoan} + InitialFinancing$$

- $r_D$  = discount rate
- $t_c$  = marginal tax rate

## Managing Risks

**Risks to a business:** Cash shortfalls, Financial distress, Agency costs, Currency fluctuations, Political instability, Weather changes

## Pricing Futures Contracts

$$F_t = S_0 * (1 + r_f - y)^t$$

$$= S_0 * (1 + StorageCost - CY)^t$$

$$NCY = ConvenienceYield - StorageCost$$

- $F_t$  = future price on contract of  $t$  length
- $S_0$  = today's spot price
- $r_f$  = risk-free interest rate
- $y$  = dividend yield
- $NCY$  = NetConvenienceYield

## Hedging Ratios and Basis Risk

$$ExpectedChangeInValueA = \alpha + \delta * (ChangeInValueB)$$

- $\delta$  = sensitivity of A to change in the value of B (hedge ratio)
- $\alpha$  = offset

## Premium- Discount Relationship

$$ForwardDiscount = \frac{1}{t_{years}} * \left( \frac{SpotPrice}{ForwardRate} - 1 \right)$$

## Binomial Method