365 CFA® Level 1

Formula Sheet

Part I

365 Careers

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01

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Quantitative Methods

02

Quantitative Methods

TIME VALUE OF MONEY

Effective Annual Rate (EAR)	**Effective annual rate** $= \left(1 + \frac{\text{Stated annual rate}}{m}\right)^{m} - 1$	
Single Cash Flow (Simplified formula)	$FV_N = PV \times (1 + r)^N$ $PV = \frac{FV_N}{(1 + r)^N}$	**r** = Interest rate per period **PV** = Present value of the investment **FVN** = Future value of the investment N periods from today
Investments paying interest more than once a year	$FV_N = PV \times \left(1 + \frac{r_s}{m}\right)^{mN}$ $PV = \frac{FV_N}{\left(1 + \frac{r_s}{m}\right)^{mN}}$	**r_s** = Stated annual interest rate **m** = Number of compounding periods per year **N** = Number of years
Future Value (FV) of an Investment with Continuous Compounding	$FV_N = PVe^{r_s N}$	
Ordinary Annuity	$FV_N = A \times \left[\frac{(1 + r)^N - 1}{r}\right]$ $PV = A \times \left[\frac{1 - \frac{1}{(1 + r)^N}}{r}\right]$	**N** = Number of time periods **A** = Annuity amount **r** = Interest rate per period
Annuity Due	$FV\ A_{Due} = FV\ A_{Ordinary} \times (1 + r) = A \times \left[\frac{(1 + r)^N - 1}{r}\right] \times (1 + r)$ $PV\ A_{Due} = FV\ A_{Ordinary} \times (1 + r) = A \times \left[\frac{1 - \frac{1}{(1 + r)^N}}{r}\right] \times (1 + r)$	**A** = Annuity amount **r** = The interest rate per period corresponding to the frequency of annuity paments (for example, annual, quarterly, or monthly) **N** = Number of annuity payments

Quantitative Methods

TIME VALUE OF MONEY

Present Value (PV) of a Perpetuity	$PV_{Perpetuity} = \frac{A}{r}$	**A =** Annuity amount
Future value (FV) of a series of unequal cash flows	$FV_N = \text{Cash flow}_1(1+r)^1 + \text{Cash flow}_2(1+r)^2 \dots \text{Cash flow}_N(1+r)^N$	
Net Present Value (NPV)	$NPV = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}$	**CF_t =** Expected net cash flow at time t **N =** Investment's projected life **r =** Discount rate or opportunity cost of capital
Internal Rate of Return (IRR)	$NPV = CF_0 + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \dots + \frac{CF_N}{(1+IRR)^N} = 0$	
Holding Period Return (HPR) No cash flows	$HPR = \frac{\text{Ending value - Beginning value}}{\text{Beginning value}}$	
Holding Period Return (HPR) Cash flows occur at the end of the period	$HPR = \frac{\text{Ending value} - \text{Beginning value} + \text{Cash flow received}}{\text{Beginning value}} = \frac{P_1 - P_0 + D_1}{\text{Beginning value}}$	**P_1 =** Ending Value **P_0 =** Beginning Value **D =** Cash flow/dividend received
Yield on a Bank Discount Basis (BDY)	$r_{BD} = \frac{D}{F} \times \frac{360}{t}$	**r_{BD} =** Annualized yield on a bank discount basis **D =** Dollar discount, which is equal to the difference between the face value of the bill (F) and its purchase price (P_0) **F =** Face value of the T-bill **t =** Actual number of days remaining to maturity
Effective annual yield (EAY)	$EAY = (1 + HPR)^{\frac{360}{t}} - 1$	**t =** Time until maturity **HPR =** Holding Period Return
Money market yield (CD equivalent yield)	$\text{Money market yield} = HPR \times \left(\frac{360}{t}\right) = \frac{360 \times r_{BankDiscount}}{360 - (t \times r_{BankDiscount})}$	

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Quantitative Methods

STATISTICAL CONCEPTS AND MARKET RETURNS

Interval Width	**Interval Width** $= \frac{\text{Range}}{k}$	**Range =** Largest observation number - Smallest Observation or number **k =** Number of desired intervals
Relative Frequency Formula	**Relative frequency** $= \frac{\text{Interval frequency}}{\text{Observations in data set}}$	
Population Mean	$\mu = \frac{\sum_{i=1 \dots n}^{N} x_i}{N} = \frac{x_1 + x_2 + x_3 + \dots + x_N}{N}$	**N =** Number of observations in the entire population X_i **=** the i^{th} observation
Sample Mean	$\bar{x} = \frac{\sum_{i=1 \dots n}^{n} x_i}{n} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$	
Geometric Mean	$G = \sqrt[n]{X_1 X_2 X_3 \dots X_n}$	**n =** Number of observations
Harmonic Mean	$\bar{x}_n = \frac{n}{\sum_{i=1 \dots n}^{n} \left(\frac{1}{x_i}\right)}$	
Median for odd numbers	**Median** $= \left\{\frac{(n+1)}{2}\right\}$	
Median of even numbers	**Median** $= \left\{\frac{(n+2)}{2}\right\}$ **Median** $= \frac{n}{2}$	

Quantitative Methods

STATISTICAL CONCEPTS AND MARKET RETURNS

Weighted Mean	$\bar{x}_w = \sum_{i=1 \dots n}^{n} w_i x_i$	**w =** Weights **X =** Observations **Sum of all weights =** 1
Portfolio Rate of Return	$r_p = w_a r_a + w_b r_b + w_c r_c + \dots + w_n r_n$	**w =** Weights **r =** Returns
Position of the Observation at a Given Percentile y	$L_y = \left\{(n+1)\frac{y}{100}\right\}$	**y =** The percentage point at which we are dividing the distribution **L_y =** The location (L) of the percentile (Py) in the array sorted in ascending order
Range	**Range =** Maximum value - Minimum value	
Mean Absolute Deviation	$MAD = \frac{\sum_{i=1 \dots n}^{n} \lvert x_i - \bar{x} \rvert}{n}$	**X =** The sample mean **n =** Number of observations in the sample
Population Variance	$\sigma^2 = \frac{\sum_{i=1 \dots n}^{N} (x_i - \mu)^2}{N}$	**μ =** Population mean **N =** Size of the population
Population Standard Deviation	$\sigma = \sqrt{\frac{\sum_{i=1 \dots n}^{N} (x_i - \mu)^2}{N}}$	**μ =** Population mean **N =** Size of the population
Sample Variance	$s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$	**X =** Sample mean **n =** Number of observations in the sample

Quantitative Methods

STATISTICAL CONCEPTS AND MARKET RETURNS

Sample Standard Deviation	$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n-1}}$$	**X** = Sample mean **n** = Number of observations in the sample
Semi-Variance	$$\text{Semi-variance} = \frac{1}{n}\sum_{r_t < \text{Mean}}^{n}(\text{Mean} - r_t)^2$$	**n** = Total number of observations below the mean r_t = Observed value
Chebyshev Inequality	Percentage of observations within *k* standard deviations of the arithmetic mean $> 1 - \frac{1}{k^2}$	**k** = Number of standard deviations from the mean
Coefficient of Variation	$$CV = \frac{s}{\overline{x}}$$	**s** = Sample standard deviation $\overline{x}$ = Sample mean
Sharpe Ratio	$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$	R_p = Mean return to the portfolio R_F = Mean return to a risk-free asset σ_p = Standard deviation of return on the portfolio
Skewness	$$S_K = \left[\frac{n}{(n-1)(n-2)}\right] \times \frac{\sum_{i=1 \ldots n}^{n}(x_i - \overline{x})^3}{s^3}$$	**n** = Number of observations in the sample **s** = Sample standard deviation
Kurtosis	$$K_E = \left[\frac{n(n+1)}{(n-1)(n-2)(n-3)} \times \frac{\sum_{i=1 \ldots n}^{n}(x_i - \overline{x})^4}{S^4}\right] - \frac{3(n-1)^2}{(n-2)(n-3)}$$	**n** = Sample size **s** = Sample standard deviation

Quantitative Methods

PROBABILITY CONCEPTS

Odds FOR E	**Odds FOR E =** $\frac{P(E)}{1 - P(E)}$	**E =** Odds for event **P(E) =** Probability of event
Conditional Probability	$P(A\|B) = \frac{P(A \cap B)}{P(B)}$	where $P(B) \neq 0$
Additive Law (The Addition Rule)	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	
The Multiplication Rule (Joint Probability)	$P(A \cap B) = P(A\|B) \times P(B)$	
The Total Probability Rule	$P(A) = P(A\|S_1) \times P(S_1) + P(A\|S_2) \times P(S_2) + \ldots + P(A\|S_n) \times P(S_n)$	**S1, S2, ..., Sn** are mutually exclusive and exhaustive scenarios or events
Expected Value	$E(X) = P(A)X_A + P(B)X_B + \ldots + P(n)X_n$	**P(n) =** Probability of an variable X_n = Value of the variable
Covariance	$COV_{xy} = \frac{(x - \overline{x})(y - \overline{y})}{n - 1}$	**x =** Value of x $\overline{X}$ = Mean of x values **y =** Value of y $\overline{y}$ = Means of y **n =** Total number of values
Correlation	$\rho = \frac{cov_{xy}}{\sigma_x \sigma_y}$	σ_x = Standard Deviation of x σ_y = Standard Deviation of y COV_{xy} = Covariance of x and y
Variance of a Random Variable	$\sigma^2 X = \sum_{i=1 \ldots n}^{n} (x - E(x))^2 \times P(x)$	The sum is taken over all values of **x** for which **p(x) > 0**
Portfolio Expected Return	$E(R_P) = E(w_1 r_1 + w_2 r_2 + w_3 r_3 + \ldots + w_n r_n)$	**w =** Constant **r =** Random variable
Portfolio Variance	$Var(R_p) = E[(R_p - E(R_p))^2] = [w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2w_1 w_2 Cov(R_1 R_2) + 2w_2 w_3 Cov(R_2 R_3) + 2w_1 w_3 Cov(R_1 R_3)]$	R_p = Return on Portfolio
Bayes' Formula	$P(A\|B) = \frac{P(B\|A) \times P(A)}{P(B)}$	
The Combination Formula	$nC_r = \binom{n}{c} = \frac{n!}{(n - r)!\, r!}$	**n =** Total objects **r =** Selected objects
The Permutation Formula	$nP_r = \frac{n!}{(n - r)!}$	

Quantitative Methods

COMMON PROBABILITY DISTRIBUTIONS

The Binomial Probability Formula	$P(x) = \frac{n!}{(n - x)!\, x!} p^x \times (1 - p)^{n - x}$	**n** = Number of trials **x** = Up moves p^x = Probability of up moves $(1 - p)^{n - x}$ = Probability of down moves
Binomial Random Variable	**E(X)** = np **Variance** = np(1 - p)	**n** = Number of trials **p** = Probability
For a Random Normal Variable X	90% confidence interval for X is $\bar{x} - 1.65s; \bar{x} + 1.65s$ 95% confidence interval for X is $\bar{x} - 1.96s; \bar{x} + 1.96s$ 99% confidence interval for X is $\bar{x} - 2.58s; \bar{x} + 2.58s$	**s** = Standard error **1.65** = Reliability factor $\bar{x}$ = Point estimate
Safety-First Ratio	$SF_{Ratio} = \left[\frac{E(R_p) - R_L}{\sigma_p}\right]$	R_p = Portfolio Return R_L = Threshold level σ_p = Standard Deviation
Continuously Compounded Rate of Return	$FV = PV \times e^{i \times t}$	**i** = Interest rate **t** = Time **ln e** = 1 **e** = The exponential function, equal to 2.71828

SAMPLING AND ESTIMATION

Sampling Error of the Mean	Sample Mean - Population Mean	
Standard Error of the Sample Mean (Known Population Variance)	$SE = \frac{\sigma}{\sqrt{n}}$	**n** = Number of samples **σ** = Standard deviation
Standard Error of the Sample Mean (Unknown Population Variance)	$SE = \frac{S}{\sqrt{n}}$	**s** = Standard deviation in unknown population's sample
Z-score	$Z = \frac{x - \mu}{\sigma}$	**x** = Observed value **σ** = Standard deviation **μ** = Population mean
Confidence Interval for Population Mean with z	$\bar{x} - Z_{\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}; \bar{x} + Z_{\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}$	$Z_{\alpha/2}$ = Reliability factor $\bar{x}$ = Mean of sample **σ** = Standard deviation **n** = Number of trials/size of the sample
Confidence Interval for Population Mean with t	$\bar{x} - t_{\frac{\alpha}{2}} \times \frac{s}{\sqrt{n}}; \bar{x} + t_{\frac{\alpha}{2}} \times \frac{s}{\sqrt{n}}$	$t_{\alpha/2}$ = Reliability factor **n** = Size of the sample **s** = Standard deviation
z or t-statistic?	**Z** ⟶ known population, standard deviation σ, no matter the sample size **t** ⟶ unknown population, standard deviation s, and sample size below 30 **Z** ⟶ unknown population, standard deviation s, and sample size above 30	

Quantitative Methods

HYPOTHESIS TESTING

Test Statistics: Population Mean	$z_\alpha = \dfrac{\overline{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$; $t_{n-1,\alpha} = \dfrac{\overline{X} - \mu}{\frac{s}{\sqrt{n}}}$	t_{n-1} = t-statistic with n − 1 degrees of freedom *(n is the sample size)* $\overline{x}$ = Sample mean **μ** = Hypothesized value of the population mean **s** = Sample standard deviation
Test Statistics: Difference in Means - Sample Variances Assumed Equal (Independent samples)	t-statistic = $\dfrac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}\right)^{\frac{1}{2}}}$ $s_p^2 = \dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$	**Number of degrees of freedom =** $= n_1 + n_2 - 2$
Test Statistics: Difference in Means - Sample Variances Assumed Unequal (Independent samples)	t-statistic = $\dfrac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^{\frac{1}{2}}}$ degrees of freedom = $\dfrac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2}}$	**S** = Standard deviation of respective sample **n** = Total number of observations in the respective population
Test Statistics: Difference in Means - Paired Comparisons Test (Dependent samples)	$t = \dfrac{\overline{d} - \mu_{d0}}{S_d}$, where $\overline{d} = \dfrac{1}{n}\sum_{i=1 \ldots n}^{n} d_i$	**degrees of freedom** = n - 1 **n** = Number of paired observations **d** = Sample mean difference S_d = Standard error of d
Test Statistics: Variance Chi-square Test	$X^2_{n-1} = \dfrac{(n-1)s^2}{\sigma_0^2}$	**degrees of freedom** = n - 1 s^2 = Sample variance σ_0^2 = Hypothesized variance
Test Statistics: Variance F-Test	$F = \dfrac{s_1^2}{s_2^2}$, where $s_1^2 > s_2^2$	**degrees of freedom** = $n_1 - 1$ and $n_2 - 1$ s_1^2 = Larger sample variance s_2^2 = Smaller sample variance

Economics

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Economics

TOPICS IN DEMAND AND SUPPLY ANALYSIS

Price Elasticity = $\frac{\%\Delta \text{ Quantity demanded } (Qx)}{\%\Delta \text{ Price } (Px)}$

0 > e > -1 → Inelastic demand
-1 > e > -∞ → Elastic demand
e = -1 → Unit elastic demand
e = 0 → Perfectly inelastic demand
e = -∞ → Perfectly elastic demand

Income Elasticity = $\frac{\%\Delta \text{ Quantity demanded } (Qx)}{\%\Delta \text{ Income } (Ix)}$

e > 0 → Normal goods
e < 0 → Inferior goods

ε_Y = Income elasticity

Cross-price Elasticity = $\frac{\%\Delta \text{ Quantity demanded } (Qx)}{\%\Delta \text{ Price of a related good } (Py)}$

e > 0 → The related product is a substitute
e < 0 → The related product is a complement

y = Related product
ε_{py} = Cross-price elasticity

THE FIRM AND MARKET STRUCTURES

For all market structures, **Max Profit** → **when MC = MR**

MC = Marginal cost
MR = Marginal revenue

Breakeven points → **AR = ATC** (perfect competition)
TR = TC (imperfect competition)

Short-run shutdown points → **AR < AVC** (perfect competition)
TR < TVC (imperfect competition)

ATC = Average Total Cost
AR = Average Revenue
TR = Total Revenue
TC = Total Cost
AR = ATC holds true in imperfect competition

Market structures:
Perfect Competition
Monopolistic Competition
Oligopoly
Monopoly

Economics

AGGREGATE OUTPUT, PRICES, AND ECONOMIC GROWTH

Total GDP = Final value of goods and services produced (market value)
+ Government services (at cost)
+ Rental value of owner-occupied housing (an estimate)

GDP Deflator = $\frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$

Nominal GDPt = Pt x Qt

Real GDPt = Pb x Qt

t = Current year
b = Base year
Pt = Prices in year t
Pb = Prices in base year
Qt = Quantity produced in year t

Expenditure Approach

Real GDP = Consumption spending (C) + Investment (I)
+ Government spending (G) + Net exports (X-M)

X = Exports
M = Imports

Income Approach

Real GDP = National income + Capital consumption allowance + Statistical discrepancy

Real GDP = Consumption spending (C) + Savings (S) + Taxes (T)

Savings (S) = Investments (I) + Fiscal Balance (G-T) + Trade Balance (X-M)

S – I = Fiscal Balance (G-T) + Trade Balance (X-M)

National Income = Employees' compensation
+ Corporate and government profits before taxes
+ Interest income
+ Unincorporated business net income (business owners' incomes)
+ Rent
+ Indirect business taxes
− Subsidies

Personal Income = National income
+ Transfer payments (social insurance, unemployment or disability payments)
− Indirect business taxes
− Corporate income taxes
− Undistributed corporate profits

Economics

AGGREGATE OUTPUT, PRICES, AND ECONOMIC GROWTH

Personal Disposable Income = Personal income - Personal taxes

Potential GDP = Aggregate hours worked x Labor productivity

→ **Aggregate hours worked =** Labor force x Average hours worked per week

→ **Growth in Potential GDP =** Growth in labor force + Growth in labor productivity

The Production Function

Y = A x f (K, L)

Y = Aggregate output
A = Total Factor Productivity (TFP)
K = Capital
L = Labor

Growth in Potential GDP = Growth in technology + WL x (growth in labor) + WC x (growth in capital)

WL = Labor's percentage share of national income
WC = Capital's percentage share of national income

UNDERSTANDING BUSINESS CYCLES

Unemployment Rate = $\dfrac{\text{Number of unemployed people}}{\text{Total labor force}}$

Participation Rate (Activity Ratio) = $\dfrac{\text{Total labor force}}{\text{Total working-age population}}$

Labor Force = Unemployed people + Employed people

Unemployed = Looking for job

Consumer Price Index = $\dfrac{\text{Cost of basket at current-year prices}}{\text{Cost of basket at base-year prices}} \times 100$

Laspeyres' Index = $\dfrac{\sum(\text{Current-year price} \times \text{Base-year quantity})}{\sum(\text{Base-year price} \times \text{Base-year quantity})}$

Fisher's Index = $\sqrt{(\text{Laspeyres' Index}) \times (\text{Paasche Price Index})}$

Paasche Price Index = $\dfrac{\Sigma(\text{Current-year price} \times \text{Current-year quantity})}{\Sigma(\text{Base-year price} \times \text{Base-year quantity})}$

Economics

MONETARY AND FISCAL POLICY

Money Multiplier = $\frac{1}{\text{Reserve requirement}}$		
Fiscal Multiplier = $\frac{1}{1 - \text{MPC} \times (1 - t)}$		**MPC** = Marginal propensity to consume **t** = Tax rate
Equation of Exchange	**MV = PY** (Money supply x Velocity = Price x Real output)	
Fisher Effect	**Nominal Interest Rate** = Real interest rate + Expected inflation rate	
Neutral Interest Rate	**Neutral interest rate** = Real trend rate of economic growth + Inflation target	

INTERNATIONAL TRADE AND CAPITAL FLOWS

GDP	**GDP** = C + I + G + X - M	**C** = Consumption **I** = Investments **G** = Government Spending **X** = Export **M** = Import
Balance of Payments	Current Account + Capital Account + Financial Account = 0	
Trade Balance	**X - M** = Private Savings + Government Savings - Investments in domestic capital	

CURRENCY EXCHANGE RATES

Real Exchange Rate = Nominal exchange rate x $\frac{\text{CPI base currency}}{\text{CPI price currency}}$

Corporate Finance

04

Corporate Finance

CAPITAL BUDGETING

Net present value (NPV)	$\text{NPV} = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}$	**CF_t =** After-tax cash flow at time *t* **r =** Required rate of return for the investment
Internal Rate of Return (IRR)	$\sum_{t=0}^{N} \frac{CF_t}{(1+IRR)^t} = 0$	
Average Accounting Rate of Return (AAR)	$\text{AAR} = \frac{\text{Average net income}}{\text{Average book value}}$	
Profitability Index (PI)	$\text{PI} = \frac{\text{PV of future cash flows}}{\text{Initial Investment}} = 1 + \frac{\text{NPV}}{\text{Initial Investment}}$	

Corporate Finance

COST OF CAPITAL

Weighted Average Cost of Capital (WACC)	**WACC =** $w_d r_d (1 - t) + w_p r_p + w_e r_e$	**w_d =** Proportion of debt that the company uses when it raises new funds **r_d =** Before-tax marginal cost of debt **t =** Company's marginal tax rate **w_p =** Proportion of preferred stock the company uses when it raises new funds **r_p =** Marginal cost of preferred stock **w_e =** Proportion of equity that the company uses when it raises new funds **r_e =** Marginal cost of equity
Tax shield	**Tax shield =** Deduction × Tax rate	
Cost of Preferred Stock	$r_p = \frac{D_p}{P_p}$	**P_p =** Current preferred stock price per share **D_p =** Preferred stock dividend per share **r_p =** Cost of preferred stock
Cost of Equity (Dividend discount model approach)	$r_e = \frac{D_1}{P_0} + g$	**P_0 =** Current market value of the equity market index **D_1 =** Dividends expected next period on the index **r_e =** Required rate of return on the market **g =** Expected growth rate of dividends
Growth Rate	$g = \left(1 - \frac{D}{EPS}\right) \text{x ROE}$	**(D/EPS) =** Assumed stable dividend payout ratio **ROE =** Historical return on equity
Cost of Equity (Bond yield plus risk premium)	$r_e = r_d + \text{Risk Premium}$	**Risk premium =** Additional yield on a company's stock relative to its bonds
Capital Asset Pricing Model (CAPM)	$E(R_i) = R_F + \beta_i [E(R_M) - R_F]$	**β_i =** Return sensitivity of stock *i* to changes in the market return **$E(R_M)$ =** Expected return on the market **$E(R_M) - R_F$ =** Expected market risk premium **RF =** Risk-free rate of interest
Beta of a Stock	$\beta_i = \frac{Cov(R_i, R_M)}{Var(R_M)}$	**Rm =** Average expected rate of return on the market **R_i =** Expected return on an asset i **Cov =** Covariance **Var =** Variance

Corporate Finance

COST OF CAPITAL

Pure-play Method Project Beta (De-lever)	$\beta_{\text{Unlevered, Comparable}} = \dfrac{\beta_{\text{Levered, Comparable}}}{\left[1 + \left((1 - t_{\text{Comparable}})\dfrac{D_{\text{Comparable}}}{E_{\text{Comparable}}}\right)\right]}$	**t** = Tax rate **D** = Debt **E** = Equity
Pure-play Method for Subject Firm (Re-lever)	$\beta_{\text{Levered, Project}} = \beta_{\text{Unlevered, Comparable}}\left[1 + \left((1 - t_{\text{Project}})\dfrac{D_{\text{Project}}}{E_{\text{Project}}}\right)\right]$	
Adjusted CAPM (for country risk premium)	$E(R_i) = R_F + \beta_i [E(R_M) - R_F + \text{Country risk premium}]$	
Country Risk Premium	$CRP = \text{Sovereign yield spread} \times \left(\dfrac{\sigma \text{ of equity index of the developing country}}{\sigma \text{ of sovereign bond market in terms of the developed market currency}}\right)$	**σ** = Standard deviation
Break Point	$\text{Break point} = \dfrac{\text{Amount of capital at which the source's cost of capital changes}}{\text{Proportion of new capital raised from the source}}$	

Corporate Finance

MEASURES OF LEVERAGE

Degree of Operating Leverage	**Degree of Operating Leverage** $= \dfrac{\text{Percentage change in operating income}}{\text{Percentage change in units sold}}$	
Degree of Financial Leverage	**Degree of Financial Leverage** $= \dfrac{\text{Percentage change in Net Income}}{\text{Percentage change in EBIT}}$	
Degree of Total Leverage	**Degree of Total Leverage** $= \dfrac{\text{Percentage change in Net Income}}{\text{Percentage change in number of Units Sold}}$	
Return on Equity (ROE)	**Return on Equity** $= \dfrac{\text{Net Income}}{\text{Shareholders' Equity}}$	
The Breakeven Quantity of Sales	$Q_{Breakeven} = \dfrac{F + C}{P - V}$	**P =** Price per unit **V =** Variable cost per unit **F =** Fixed operating costs **C =** Fixed financial cost **Q =** Quantity of units produced and sold
Operating Breakeven Quantity of Sales	$Q_{Operating\ Breakeven} = \dfrac{F}{P - V}$	**P =** Price per unit **V =** Variable cost per unit **F =** Fixed operating costs

Corporate Finance

WORKING CAPITAL MANAGEMENT

Current Ratio	$\textbf{Current Ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$
Quick Ratio	$\textbf{Quick Ratio} = \frac{\text{Cash + Receivables + Short-term marketable investments}}{\text{Current liabilities}}$
Accounts Receivable Turnover	$\textbf{Accounts Receivable Turnover} = \frac{\text{Credit sales}}{\text{Average receivables}}$
Number of Days of Receivables	$\textbf{Number of days of receivables} = \frac{365}{\text{Accounts receivable turnover}}$
Inventory Turnover	$\textbf{Inventory Turnover} = \frac{\text{Cost of goods sold}}{\text{Average Inventory}}$
Number of Days of Inventory	$\textbf{Number of Days of Inventory} = \frac{365}{\text{Inventory turnover}}$
Payables Turnover	$\textbf{Payables Turnover Ratio} = \frac{\text{Purchases}}{\text{Average accounts payables}}$
Number of Days of Payables	$\textbf{Number of Days of Payables} = \frac{365}{\text{Payables turnover ratio}}$
Net Operating Cycle	**Net operating cycle =** Number of days of inventory + Number of days of receivables - Number of days of payables
Yield on a Bank Discount Basis (BDY)	$r_{BD} = \frac{D}{F} \times \frac{360}{t}$ **D =** Dollar discount, which is equal to the difference between the face value of the bill (F) and its purchase price (P_0) **F =** Face value of the T-bill **t =** Actual number of days remaining to maturity r_{BD} **=** Annualized yield on a bank discount basis
Effective Annual Yield (EAY)	$\textbf{EAY} = (1 + \text{HPR})^{\frac{360}{t}} - 1$
Holding Period Return	$\textbf{HPR} = \frac{\text{(Cashflow ending value - Beginning value + Cashflow received)}}{\text{Beginning value}}$
Cost of Trade Credit	$\textbf{Cost of trade credit} = \left(1 + \frac{\text{\%Discount}}{1 - \text{\%Discount}}\right)^{\frac{360}{\text{Number of days past discount}}} - 1$
Cost of Borrowing	$\textbf{Cost of borrowing} = \frac{\text{Interest + Dealer's commission + Other costs}}{\text{Loan amount - Interest}}$

Alternative Investments

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Alternative Investments

Leverage Ratio*	**Leverage =** $\frac{\text{Total Debt}}{\text{Total Equity}}$	* This is one of several definitions and formulas for leverage, also known as Debt-to-Equity ratio
Volatility (standard deviation of returns) - population	$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{avg})^2}{n}}$	R_i = Individual returns data points R_{avg} = Average of all return data points in the set **n** = Number of data points
Volatility (standard deviation of returns) - sample	$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{avg})^2}{n-1}}$	R_i = Individual returns data points R_{avg} = Average of all return data points in the set **n** = Number of data points
Sharpe Ratio	**Sharpe Ratio =** $\frac{R_p - R_f}{\sigma_p}$	R_p = Portfolio return R_f = Risk-free rate of return σ_p = Standard deviation (volatility) of portfolio return
Sortino Ratio	**Sortino Ratio =** $\frac{R_p - R_f}{\sigma_d}$	R_p = Portfolio return R_f = Risk-free rate of return σ_p = Standard deviation (volatility) of the downside ("downside risk")
Downside Risk (semi-deviation) - population	$\sigma_d = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{treshold})^2}{n}}$	R_i = Individual returns data points $R_{treshold}$ = Return threshold (determined by the user, for example the risk-free rate, hard target return or 0% can be used) **n** = Number of data points
Downside Risk (semi-deviation) - sample	$\sigma_d = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{treshold})^2}{n-1}}$	R_i = Individual returns data points $R_{treshold}$ = Return threshold (determined by the user, for example the risk-free rate, hard target return or 0% can be used) **n** = Number of data points
Discounted Cash Flow DCF = Net Present Value (NPV) of an investment	**DCF = NPV =** $\sum_{t=0}^{N}\frac{CF_t}{(1+r)^t}$	CF_t = Cash flow in time t **r** = Discount rate
Capitalization Rate (Cap Rate)	**Cap rate =** $\frac{\text{Net Operating Income (NOI)}}{\text{Market Value (or purchase price of property)}}$	
Funds From Operations (FFO)	**FFO =** Net Income + Depreciation (and other non-cash items) - Gains/Losses from property sales (and other non-recurring items)	
Adjusted Funds From Operations (AFFO)	**AFFO =** FFO – Recurring Capital Expenditures (CAPEX)	
Net Asset Value per share (NAV per share)	**NAV per share =** $\frac{\text{NAV}}{\text{Total number of shares outstanding}}$	

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