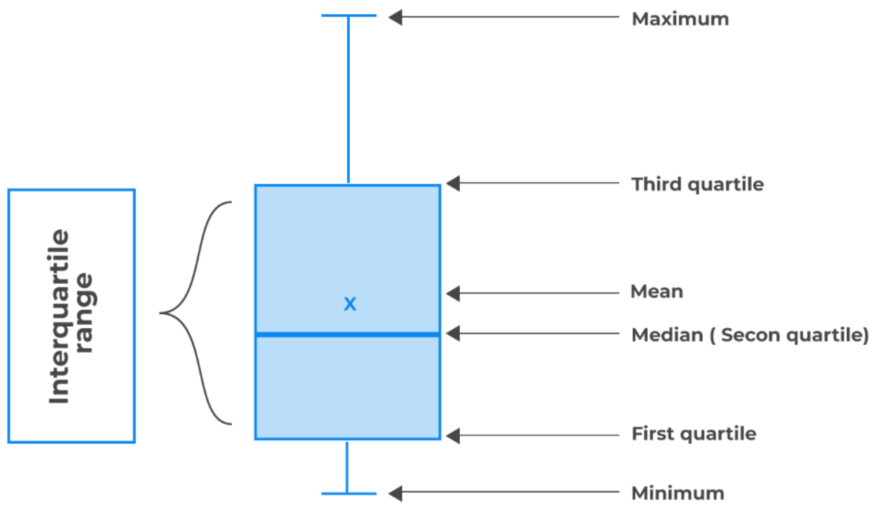
TOPIC			VARIABLES
QUANTITATIVE ANALYSIS	Nominal Risk-free Rate	(1 + Nominal risk-free rate) = (1 + Real risk-free rate) (1 + Inflation premium)	
	Approximation of Nominal Risk-free Rate	Nominal risk-free rate = Real risk-free rate + Inflation premium	
	Holding Period Return (R)	$R = \frac{(P_1 - P_0) + I_1}{P_0}$	P_0 – Price at time 0 P_1 – Price at time 1 I_1 – Interest earned during period
	Geometric mean return	$\bar{R}_{Gi} = ((1 + R_{i1} \times (1 + R_{i2}) \times \ldots (1 + R_{i,T-1}) \times (1 + R_{i,T}))^{\frac{1}{T}} - 1$ $= \sqrt[T]{\prod_{t=1}^{T}(1 + R_t) - 1}$	R_{it} – Return in period t T – Total number of periods
	Harmonic Mean	$\bar{X}_H = \frac{n}{\sum_{i=1}^{n}\frac{1}{X_i}}, X_i > 0 \text{ for } i = 1, 2, \ldots, n.$	X_i – Individual observations n – Number of observed values
	Present Value (PV)	$PV = FV_N\left(1 + \frac{R_s}{m}\right)^{-mN}$	FV – Future Value R_s – Stated annual interest rate m – Number of compounding periods per year N – Number of years

	Annualizing Returns	$R_{annual} = \left(1 + R_{period}\right)^c - 1$	c – Number of periods in a year R_{period} – return for a period less than a year.
	Continuously Compounded Return ($r_{0,T}$)	$r_{0,T} = \ln\left(\frac{P_T}{P_0}\right)$	P_0 – Price of an asset at time t = 0 P_T – Price of an asset at time t = T
	Real Return	$(1 + \text{real retun}) = \frac{(1 + \text{Real risk free rate})(1 + \text{Risk premium})}{(1 + \text{Inflation premium})}$	
	Internal Rate of Return (IRR)	$\sum_{t=0}^{T} \frac{CF_t}{(1 + IRR)^t} = 0$	CF_t – Cash flows at period t. T – The number of periods
	Return on a Leveraged Portfolio (R_L)	$R_L = \frac{\text{Portfolio Return}}{\text{Portfolio Equity}} = \frac{[R_P \times (V_E + V_B) - (V_B \times r_D)]}{V_E} = R_P + \frac{V_B}{V_E}(R_P - r_D)$	V_E – The equity of the portfolio V_B – Borrowed funds R_P – Total return on leveraged portfolio r_D – Cost of debt
	Future Value (FV) of a Cash Flow	$FV_t = PV(1 + r)^t$	FV_t – Future value of a cashflow at time t. PV – Present value of a cashflow

	Future Value (FV) of a Cash Flow under Continuous Compounding	$FV_t = PVe^{rt}$	
	Present Value (PV) of a Cash Flow	$PV = FV_t(1+r)^{-t}$	FV_t – Future value of a cashflow at time t. PV – Present value of a cashflow
	Present Value (PV) of a Cash Flow under Continuous Compounding	$PV = FV_t e^{-t}$	
	PV (Discount Bond)	$PV = FV_t(1+r)^{-t}$	PV – Price paid FV – Full principal (FV) received at maturity.
	PV (Coupon Bond)	$\text{PV(Coupon Bond)} = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \cdots + \frac{(PMT_N + FV_N)}{(1+r)^N}$	PMT = Coupon payment. FV = Future value. r = Market discount rate (YTM). N = Number of periods.
	PV (Perpetual Bond)	$\text{PV(Perpetual Bond)} = \frac{PMT}{r}$	PMT = Coupon payment. r = Market discount rate (YTM).

	Future value of an ordinary annuity	$FV_N = A\left[\frac{(1+r)^N - 1}{r}\right]$	A – Annuity amount N – Number of years r – Rate of return
	Periodic annuity cash flow (A) of an ordinary annuity	$A = \frac{r(PV)}{1-(1+r)^{-t}}$	r – Market interest rate for period PV – Present value/principal amount of loan t – number of payment periods
	Present value of an ordinary annuity	$PV = A\left[\frac{1-\left(\frac{1}{(1+r)^N}\right)}{r}\right]$	A – Annuity amount N – Number of years r – Rate of return
	Present value of a perpetuity	$\frac{A}{r}$	A – Annuity amount r – Required rate of return
	Price of a preferred or common share (paying a constant periodic dividend)	$PV_t = \frac{D_t}{r}$	PV_t – Present value at time t. D_t – Dividend payment at time t. r – Discount rate.
	Price of a preferred or common share (assume a constant dividend growth rate (g) into perpetuity)	$PV_t = \frac{D_{t+1}}{r-g}$, where $(r-g) > 0$	PV_t – Present value at time t. D_{t+1} – Expected Dividend in the next period. r – Required rate of return. g – Constant growth rate.

	Sample Mean	$\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n}$	x_i – Individual observations n – Number of observed values
	Median of odd-numbered sample of n observations	Occupies the $\frac{n+1}{2}$ position.	
	Median of Even-Numbered Sample of n Observations	mean of the values of the observations occupying the $\frac{n}{2}$ and $\frac{n+2}{2}$ positions (the two middle observations).	
	Trimmed Mean	Computing arithmetic mean after excluding a stated small percentage of the lowest and highest values.	
	Winsorized Mean	Computing arithmetic mean after assigning one specified low value to a stated percentage of the lowest values in the dataset and one specified high value to a stated percentage of the highest values in the dataset.	
	Interquartile Range (IQR)	$IQR = Q_3 - Q_1$	Q_1– First quartile Q_3– Third quartile

	Box and Whisker Plot		
	Position of observation at a given percentile	$L_y = (n+1) \times \frac{y}{100}$	L_y – position of percentile n – Number of observations y – Percentiles
	Range	Max value – Min Value	
	Mean Absolute Deviation	$\frac{\sum_{1=1}^{N}\lvert X_i - \bar{X}\rvert}{n}$	X_i – Individual observed value $\bar{X}$ – Individual values n – Number of observed values

	Population Variance	$$\sigma^2 = \frac{\sum_{i=1}^{N}(X_i-\mu)^2}{N}$$	X_i – Individual observed value μ – Population mean N – Number of observations
	Sample Variance	$$s^2 = \frac{\sum_{i=1}^{N}(X_i-\overline{X})^2}{n-1}$$	X_i – Individual observed value μ – Sample mean N – Number of observations
	Sample target semi–deviation	$$S_{Target} = \sqrt{\sum_{\text{for all } X_i \leq B}^{n} \frac{(X_i - B)^2}{n-1}}$$	X_i – Individual observations n – Number of observed values B – Target value
	Coefficient of Variation	$$CV = \frac{s}{\overline{X}}$$	s – Sample standard deviation $\overline{X}$ – Sample mean
	Sample covariance of X and Y	$$s_{XY} = \frac{\sum_{i=1}^{N}(X_i - \overline{X})(Y_i - \overline{Y})}{n-1}$$	x_i – individual observed value $\overline{x}$ – Individual values y_i – Individual observed value $\overline{y}$ – Individual values n – Number of observed values

	Sample correlation coefficient	$r_{XY} = \frac{s_{XY}}{s_X \times s_Y}$	s_{XY} – sample covraince s_X – Standard deviation of x s_Y – Standard deviation of y
	Sample Skewness	$\text{Skewness} = \frac{1}{n} \times \frac{\sum_{i=1}^{n}(X_i - \overline{X})^3}{s^3}$	n – Number of observations X_i – Individual observed values $\overline{X}$ – Sample mean s – Sample standard deviation
	Sample Kurtosis	$\frac{1}{n} \times \frac{\sum_{i=1}^{n}(X_i - \overline{X})^4}{s^4}$	n – Number of observations X_i – Individual observed values $\overline{X}$ – Sample mean s – Sample standard deviation
	Sample Excess Kurtosis	$K_E = \left[\frac{1}{n} \times \frac{\sum_{i=1}^{n}(X_i - \overline{X})^4}{s^4}\right] - 3$	n – Number of observations X_i – Individual observed values $\overline{X}$ – Sample mean s – Sample standard deviation

	Expected Value of a Discrete Random Variable	$E(X) = P(X_1)X_1 + P(X_2)X_2 + \cdots + P(X_n)X_n = \sum_{i=1}^{n} P(X_i)X_i$	Where, X_i – One of n possible outcomes of the discrete random variable X. $P(X_i) = P(X_i = x_i)$ – Probability of X taking the value x.
	Variance of a Discrete Random Variable	$\sigma^2(X) = E[X - E(X)]^2 = P(X_1)[X_1 - E(X)]^2 + P(X_2)[X_2 - E(X)]^2 + \cdots + P(X_n)[X_n - E(X)]^2 = \sum_{i=1}^{n} P(X_i)[X_i - E(X)]^2$	
	Conditional Expectation	$E(X \mid S) = X_1 \cdot P(X_1 \mid S) + X_2 \cdot P(X_2 \mid S) + \cdots + X_n \cdot P(X_n \mid S) = \sum_{i=1}^{n} X_i \cdot P(X_i \mid S)$	$X_1, X_2, \ldots X_n$ – Outcomes form a set of mutually exclusive and exhaustive events. S – A scenario or event
	Total Probability Rule for Expected Value	$E(X) = P(S_1) \cdot E(X \mid S_1) + P(S_1) \cdot E(X \mid S_1) + \cdots + P(S_n) \cdot E(X \mid S_n) = \sum_{i=1}^{n} P(S_i) \cdot E(X \mid S_i)$	$S_1, S_2, \ldots S_n$ – Mutually exclusive and exhaustive scenarios or events.
	Bayes' Formula (Updated Probability)	$\text{Updated Probability} = \frac{\text{Probability of new information for an event}}{\text{Unconditional probability of new information}} \times \text{Prior Probability}$	

	Bayes' Formula (Probability Notation)	$P(\text{Event} \mid \text{Information}) = \frac{P(\text{Information} \mid \text{Event})}{P(\text{Information})} \times P(\text{Event})$	
	Expected Return on the Portfolio $(E(R_p))$	$E(R_p) = w_1E(R_1) + w_2E(R_2) + \cdots w_nE(R_n)$	$w_1, w_2, \dots, w_n$ – Weights (market value of asset/market value of the portfolio) attached to assets 1,2, … , n. $R_1, R_2, \dots, R_n$ – Expected returns for assets 1,2, … , n.
	Portfolio Variance (with two assets A and B)	$\text{Portfolio Variance} = w_A^2\sigma^2(R_A) + w_B^2\sigma^2(R_B) + 2(w_A)(w_B)\text{Cov}(R_A, R_B)$	w_A – Weight of assets A in the portfolio. w_B – Weight of assets B in the portfolio $\sigma^2(R_A)$ – Variance of the returns on assets A. $\sigma^2(R_B)$ –Variance of the returns on assets B.

	Covariance between Random Variables X and Y	$\text{Cov}(X,Y) = \sigma(X,Y) = E[(X - E[X])(Y - E[Y])$	Cov(X, Y) – Covariance of X and Y E[X] – Expected value of the random variable X. E[Y] – Expected values of the random variable Y.
	Sample Covariance	$\text{Cov}(X,Y) = \sum_{i=1}^{n} \frac{(X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$	$\bar{X}$ – Sample mean of X. $\bar{Y}$ – Sample mean of Y. X_i and Y_i – i-th data points of X and Y, respectively.
	Correlation between Random Variables X and Y	$\text{Corr}(X,Y) = \rho(X,Y) = \frac{\text{Cov}(X,Y)}{\text{Standard deviation}(X) \times \text{Standard deviation}(Y)} = \frac{\text{Cov}(X,Y)}{\sigma_X \sigma_Y}$	
	Safety First Ratio (SF)	$\frac{E(R_p) - R_L}{\sigma_p}$	$E(R_p)$ – Expected Portfolio return R_L – Threshold level of return σ_p– Standard deviation of the portfolio
	Mean and Variance of Lognormal Distribution	Mean: $\mu_L = e^{\left(\mu + \frac{1}{2}\sigma^2\right)}$ Variance: $\sigma_L^2 = e^{2u+\sigma^2}\left(e^{\sigma^2} - 1\right)$	μ and σ – Mean and variance of the associated normal distribution

	Standard Error of Sample Mean	$\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$	σ – Population standard deviation n – Number of observations
	Standard Error of Sample Mean when Population Standard deviation is Unknown	$s_{\bar{X}} = \frac{s}{\sqrt{n}}$	s – Sample standard deviation n – Number of observations
	Central Limit Theorem (CLT)	Given a population described by any probability distribution having mean μ and finite variance σ^2, the sampling distribution of the sample mean $\bar{X}$ computed from random samples of size n from this population will be approximately normal with mean μ (the population mean) and variance $\frac{\sigma^2}{n}$ (the population variance divided by n) when the sample size n is large	
	Test of a single mean (t–distributed)	$t_{n-1} = \frac{\bar{X} - \mu_o}{s/\sqrt{n}}$	$\bar{x}$ – Sample mean μ_o – Hypothesized value of the population mean s – Sample standard deviation n – Sample size
	Test of Differences in Means with Independent Samples (t-distributed)	$t_{n_1+n_2-2} = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}\right)^{\frac{1}{2}}}$ Where: $s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$	$\bar{X}_1$ – Mean of the first sample μ_1 – Population of the first population μ_2 – Population of the second population $\bar{X}_2$ – Mean of the second sample

			s_1^2 – Variance of the first sample s_2^2– Variance of the second sample n_1 – Number of observations of the first sample n_2 – Number of observations of the second sample
	Test of the Mean of Differences (t-distributed)	$t_{n-1} = \frac{\bar{d} - u_{d0}}{s_{\bar{d}}}$	$\bar{d}$ – Sample mean difference u_{d0} – hypothesized value of population mean differences $s_{\bar{d}}$ – standard error of $\bar{d}$.
	Test of a Single Variance (Chi-square Distributed)	$\chi^2_{n-1} = \frac{(n-1)s^2}{\sigma_o^2}$	χ^2_{n-1} - The chi-square statistic with (n−1) degrees of freedom n – Sample size s^2 – Sample variance σ_o^2 – Known population variance
	Test of Difference in Variances (F-distributed)	$F_{n-1,n-2} = \frac{s^2_{Before}}{s^2_{After}}$	s^2_{Before} – Sample variance before an event s^2_{After} – Sample variance after an event

	Test of a Correlation (t-Distributed)	$t_{n-2} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$	r – Correlation coefficient n – Sample size
	Type I error	Results from falsely rejecting the null hypothesis when it is true.	
	Type II error	Results from failing to reject the null hypothesis when it is false.	Type II error
	Spearman Rank Correlation Coefficient (r_S)	$r_S = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$	d_i^2 – Squared differences in ranks n – Sample size
	Test of independence (categorical data)	$X^2 = \sum_{i=1}^{m} \frac{(O_{ij}-E_{ij})^2}{E_{ij}}$ $df = (r-1)(c-1)$ $E_{ij} = \frac{(\text{Total row i}) \times (\text{Total Column j})}{\text{Overall Total}}$	m – Number of cells in the table, which is the number of groups in the first class multiplied by the number of groups in the second class O_{ij} – Observed frequency in the cell at the i-th row and j-th column of the contingency table. E_{ij} – Expected frequency in the same cell, which is calculated under the assumption of independence between the row and column variables. r – Number of rows

			c – Number of columns.
	Slope coefficient	$\hat{b}_1 = \frac{\text{Covairance of Y and X}}{\text{Variance of X}} = \frac{\frac{\sum_{i=1}^{N}(Y_i - \bar{Y})(X_i - \bar{X})}{n-1}}{\frac{\sum_{i=1}^{N}(X_i - \bar{X})^2}{n-1}} = \frac{\sum_{i=1}^{N}(Y_i - \bar{Y})(X_i - \bar{X})}{\sum_{i=1}^{N}(X_i - \bar{X})^2}$	Y_i – Particular observation of variable Y $\bar{Y}$ – Mean value of Y X_i – Particular observation of variable X $\bar{X}$ – Mean value of X n – Sample size
	Intercept	$\hat{b} = \bar{Y} - \hat{b}_1\bar{X}$	$\bar{Y}$ – Mean value of Y $\hat{b}_1$ –Slope Coefficient $\bar{X}$ – Mean value of X
	Total sum of squares (SST)	$SST = \sum_{i=1}^{n}(Y_i - \bar{Y})^2$	n - The number of observations or data points. Y_i –The actual or observed values of the dependent variable $\bar{Y}$ –The mean of the observed values of the dependent variable.

	Sum of Squares Regression (SSR)	$$SSR = \sum_{i=1}^{n} (\hat{Y}_i - \bar{Y})^2$$	n – Number of observations or data points. $\hat{Y}_i$ – Predicted values of the dependent variable based on the regression model. $\bar{Y}$ – Mean of the observed values of the dependent variable.
	Sum of squared errors or residuals (SSE)	$$SSE = \sum_{i=1}^{N} \left(Y_i - \hat{Y}_i\right)^2$$	n – Number of observations or data points. Y_i – Actual or observed values of the dependent variable. $\hat{Y}_i$ – Predicted values of the dependent variable based on the regression model.
	Coefficient of determination (R^2)	$$R^2 = \frac{\text{Explained variation}}{\text{Total variation}} = \frac{\text{Sum of Squares Regression(SSR)}}{\text{Sum of squares total(SST)}}$$	
	F–statistic	$$F = \frac{\frac{SSR}{k}}{\frac{SSE}{n-(k+1)}} = \frac{\text{Mean square regression}}{\text{Mean square error}} = \frac{MSR}{MSE}$$	n – Total number of observations (n) k – Total number of independent variables RSS – Regression sum of squares SSE – Sum of squared errors or residuals

	Standard error of estimate (SEE)	$SEE = \sqrt{MSE}$	MSE – Mean Square Error
	Standard error of the slope coefficient ($S_{\hat{b}_1}$)	$S_{\hat{b}_1} = \frac{SEE}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2}} = \frac{\text{model's standard error of the estimate}}{\text{square root of the variation of the independent variable}}$	X_i – Individual values of the independent variable. $\bar{X}$ – Mean of the independent variable.
	Standard Error of the Intercept	$S_{\hat{b}_0} = \sqrt{\frac{1}{n} + \frac{\bar{X}^2}{\sum_{i=1}^{n}(X_i - \bar{X})^2}}$	n – Number of observations in the sample. X_i – Individual values of the independent variable. $\bar{X}$ – Mean of the independent variable.
	Standard Error of the Forecast	$s_f^2 = s_e^2\left[1 + \frac{1}{n} + \frac{(X_f - \bar{X})^2}{\sum_{i=1}^{n}(X_i - \bar{X})^2}\right]$	s_e^2 – The squared standard error of estimate n – Number of observations X_f – Value of the independent variable $\bar{X}$ – Estimated mean s^2 – Variance of the independent variable

	Log–lin model	$\ln Y_i = b_0 + b_1X_i$	Y_i – Dependent variable b_0 – Intercept b_1 – Slope coefficient X_i – Independent variable
	Lin–log model	$Y_i = b_0 + b_1 \ln X_i$	Y_i – Dependent variable b_0 – Intercept b_1 – Slope coefficient X_i – Independent variable
	Log–log model	$\ln Y_i = b_0 + b_1 \ln X_i$	Y_i – Dependent variable b_0 – Intercept b_1 – Slope coefficient X_i – Independent variable

ECONOMICS	Budget Surplus or Deficit	$\text{Budget Surplus or Deficit} = G - T + B$	G – Government spending T – Taxes B – Payment of transfer of benefits
	Disposable Income (YD)	$YD = Y - NT = (1 - t)Y$	Y – National income or output NT – Net taxes t – Net tax rate
	Fiscal Multiplier	$\text{Fiscal Multiplier} = \dfrac{1}{1 - MPC(1 - t)}$	MPC – Marginal Propensity to Consume t – Net tax rate
	Marginal Propensity to save (MPS)	$MPS = 1 - MPC$	MPC – Marginal Propensity to Consume
	Real Exchange Rate	$\text{Real Exchange Rate}_{d/f} = S_{d/f} \times \left(\dfrac{P_f}{P_d}\right)$	P_f – Foreign price level quoted in terms of the foreign currency P_D – Domestic price level quoted in terms of the domestic currency $S_{d/f}$ – Spot exchange rate quoted in terms of the number of units of domestic currency per one unit of foreign

			currency
	Percentage Change in Real Exchange Rate	$\left(1+\frac{\Delta S_{d/f}}{S_{d/f}}\right)\times\frac{\left(1+\frac{\Delta P_f}{P_f}\right)}{\left(1+\frac{\Delta P_d}{P_d}\right)}$	ΔP_f – Change in foreign price level quoted in terms of the foreign currency ΔP_D – Change in domestic price level quoted in terms of the domestic currency $\Delta S_{d/f}$ – Change in spot exchange rate quoted in terms of the number of units of domestic currency per one unit of foreign currency
	Relationship between trade balance and expenditure/savings	$(S-I)=(G-T)+(X-M)$	$S-I$ – Excess of private saving over domestic investment $(G-T)$ – Fiscal Balance $(X-M)$ – Trade Balance
	Cross Rates	$\frac{X}{Y}\times\frac{Y}{Z}=\frac{X}{Z}$	X, Y, Z – Variables representing nominal exchange rates

	Forward Rate ($F_{f/d}$)Calculation	$F_{f/d} = S_{f/d} \times \left(\frac{1+r_f}{1+r_d}\right)$	$F_{f/d}$ – Forward rate $S_{f/d}$ – Spot rate i_f – Foreign interest rate i_d – Domestic interest rate
	Forward Rate ($F_{f/d}$) Calculation incorporating fractional period (τ)	$F_{f/d} = S_{f/d} \times \left(\frac{1+r_f\tau}{1+r_d\tau}\right)$	τ – Investment horizon $F_{f/d}$ – Forward rate $S_{f/d}$ – Spot rate i_f – Foreign interest rate i_d – Domestic interest rate
	Forward Discount or Premiums	$F_{f/d} - S_{f/d} = \times \left(\frac{r_f - r_d}{1+r_d\tau}\right)\tau$	τ – Investment horizon $F_{f/d}$ – Forward rate $S_{f/d}$ – Spot rate i_f – Foreign interest rate i_d – Domestic interest rate

PORTFOLIO MANAGEMENT	Utility of the Investment (U)	$U_p = E(R_p) - \lambda\sigma_p^2$	U_p – Expected return of the portfolio $E(R_p)$ – Expected return of the portfolio λ – Measure of the investor's risk aversion σ_p – Standard deviation of returns of the portfolio
	Expected Return of a Portfolio of Two Assets, One of which is Risk-free Asset	$E(R_p) = w_1R_f + (1 - w_1)E(R_i)$	$E(R_p)$ – Portfolio expected return R_f – Return from risk-free asset $E(R_i)$ – Expected return from the risky asset. w_1 – Weight in the risk-free asset $1 - w_1$ – Weight in the risky asset

	Variance of a Portfolio of Two Assets, One of which is Risk-free Asset	$\sigma_p = (1 - w_1)^2 \sigma_i^2$	σ_p – Portfolio variance. $1 - w_1$ – Weight in the risky asset σ_i^2 – Variance of the risky asset.
	Expected Return of a Portfolio of Two Risky Assets	$E(R_p) = w_1 R_1 + (1 - w_1) R_2$	$E(R_p)$ – Portfolio expected return w_1 – Weight in the risk-free asset $1 - w_1$ – Weight in the risky asset

	Equation of Capital Allocation Line (CAL)	$E(R_p) = R_f + \left(\frac{(E(R_i) - R_f)}{\sigma_i}\right)\sigma_P$	$E(R_p)$ – Portfolio expected return R_f – Return from risk-free asset $E(R_i)$ – Expected return from the risky asset. σ_p – Portfolio variance. σ_i – Standard deviation of the risky asset. σ_p – Portfolio variance.

	Variance and Standard deviation of a Portfolio of Two Risky Assets	Variance: $\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\text{Cov}(R_1, R_2)$ $= w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2$ Standard Deviation: $\sigma_p = \sqrt{\sigma_p^2}$	
	Covariance between Returns of Assets 1 and 2	$\text{Cov}(R_1, R_2) = \rho_{12}\sigma_1\sigma_2$	$\text{Cov}(R_1, R_2)$ – Covariance between the returns of Asset 1 and Asset 2. ρ_{12}– Correlation coefficient between Asset 1 and Asset 2. σ_1 – Standard deviation of returns for Asset 1. σ_2 – Standard deviation of returns for Asset 2.
	Variance of Portfolio with many Risky Assets Assuming Equal Weighting	$\sigma_P^2 = \frac{\bar{\sigma}^2}{N} + \frac{(N-1)}{N}\overline{\text{Cov}}$	σ_P^2 – Variance of portfolio with many risky assets. N – Number of Assets. $\bar{\sigma}^2$ – Average variance. $\overline{\text{Cov}}$ – Average covariance.
	Equation of the Capital Market Line (CML)	$E(R_P) = R_f + \left(\frac{E(R_m) - R_f}{\sigma_m}\right) \times \sigma_p$	$E(R_P)$ – Expected return of the portfolio. R_f – Risk-free rate. $E(R_m)$ – Expected return of the market portfolio. σ_m – Standard deviation of the market's return. σ_p – Standard deviation of the portfolio's returns

	Beta of an Asset	$\beta_i = \frac{Cov(R_i, R_m)}{\sigma_m^2} = \frac{\rho_{i,m}\sigma_i\sigma_m}{\sigma_m^2} = \frac{\rho_{i,m}\sigma_i}{\sigma_m}$	β_i – Beta coefficient of the asset. $Cov(R_i, R_m)$ – Covariance between the returns of the asset and the returns of the market. σ_m^2– Variance of the market's returns (R_m). $\rho_{i,m}$– Correlation coefficient between the returns of the asset R_i and returns of the market R_m. σ_i – Standard deviation (volatility) of the returns of the asset.
	Capital Asset Pricing Model (CAPM)	$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$	$E(R_i)$ – Expected return on a specific asset. R_f – Risk-free rate. β_i – Beta coefficient of the asset. $E(R_m)$ – Expected return on the overall market.
	Sharpe Ratio	$SR = \frac{E(R_p) - R_f}{\sigma_p}$	$E(R_p)$– Expected return of the portfolio R_f – Risk– free rate of interest σ_p – Return volatility (standard deviation of returns) of the portfolio

	M^2: Risk–Adjusted Performance (RAP)	$M^2 = [E(R_p) - R_f] \times \frac{\sigma_m}{\sigma_p} - R_f$	R_p– Expected return of the portfolio R_f – Risk– free rate of interest σ_p – Standard deviation of the portfolio σ_m– Standard deviation of the market portfolio
	Treynor Ratio	$TR = \frac{E(R_p) - R_f}{\beta_p}$	$E(R_p)$ – Expected return of the portfolio R_f – Risk– free rate of interest β_p – Beta of the portfolio, a measure of how sensitive the portfolio is to changes in the overall market
	Jensen's Alpha	$\alpha_p = R_p - \{R_f + \beta_p[\,E(R_m) - R_f]\}$	R_p – Return of the portfolio R_f – Risk– free rate of interest $E(R_m)$ – Expected return of the market β_p – Beta of the portfolio If α_p is positive, then the portfolio has outperformed the market and vice versa
FINANCIAL REPORTING AND ANALYSIS	Basic EPS	$\text{Basic EPS} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Weighted Average Shares Outstanding}}$	EPS – Earnings Per Share
	Diluted EPS (Preference Dividends Converted)	$\text{Diluted EPS} = \frac{\text{Net Income}}{\text{(Weighted Average Shares Outstanding + New Common Shares that would have been issued at conversion)}}$	EPS – Earnings Per Share

	Diluted EPS (Bonds Converted)	$\text{Diluted EPS} = \dfrac{\text{NI} + \text{Afte tax interest on convertible bond} - \text{Preferred dividends}}{(\text{Weighted Average Shares Outstanding} + \text{Additional common shares that would have been issued at conversion})}$	NI – Net Income EPS – Earnings Per Share
	Diluted EPS (Stock Options for Executives)	$\text{Diluted EPS} = \dfrac{(\text{Net Income} - \text{Preferred Dividends})}{[\text{Weighted average number of shares outstanding} + (\text{New shares that would have been issued at option exercise} - \text{Shares that would have been purchased with cash received upon exercise}) \times (\text{Proportion of year during which the financial instruments were outstanding})]}$	EPS – Earnings Per Share
	Ending Accounts Receivable	$\text{Ending Accounts Receivable} = \text{Beginning Accounts Receivable} + \text{Revenues} - \text{Cash Collected from Customers}$	
	Cash Collected from Customers	$\text{Cash Received from Customers} = \text{Revenue} - \text{Increase in Accounts receivable}$ **OR** $\text{Cash Received from Customers} = \text{Beginning Accounts Receivable} + \text{Revenues} - \text{Ending Accounts Receivable}$	
	Cash Paid to Suppliers	$\text{Cash paid to Suppliers} = \text{Purchases from Suppliers} - \text{Increase in Accounts Payable}$ **OR** $\text{Cash paid to Suppliers} = \text{Cost of goods Sold} + \text{Increase in inventory} - \text{Increase in accounts Payable}$	
	Ending Inventory	$\text{Ending Inventory} = \text{Beginning Inventory} + \text{Purchases} - \text{Cost of goods Sold}$	

	Ending Accounts Payable	$\text{Ending Accounts Payable} = \text{Beginning Accounts Payable} + \text{Purchases} - \text{Cash Paid to Suppliers}$	
	Cash Paid to Employees	$\text{Cash Paid to Employees} = \text{Salaries and Wages Expense} - \text{Increase in Salary and Wages Payable}$ **OR** $\text{Cash Paid to Employees} = \text{Beginning Salary and Wages Payable} + \text{Salary and Wages Expense} - \text{Ending Salary and Wages Payable}$	
	Cash Paid for Operating Expenses	$\text{Cash paid for Other Operating Expenses} = \text{Other Operating Expenses} - \text{Decrease in in prepaid Expenses} - \text{Increase in other accrued Liabilities}$	
	Cash paid for Interest	$\text{Cash paid for Interest} = \text{Interest Expense} + \text{Decrease in Interest Payable}$	
	Ending Interest Payable	$\text{Ending Interest Payable} = \text{Beginning Interest Payable} + \text{Interest Expense} - \text{Cash paid for Interest}$	
	Cash paid for Income Taxes	$\text{Cash Paid for Income Taxes} = \text{Income Tax Expense} - \text{Increase in Income Tax Payable}$	

<table>
<tr><td></td><td>Free cash flow to the firm (FCFF)</td><td>$$\mathrm{FCFF} = \mathrm{NI} + \mathrm{NCC} + \mathrm{Int}(1 - \mathrm{Taxrate}) - \mathrm{FCInv} - \mathrm{WCInv}$$
OR
$$\mathrm{FCFF} = \mathrm{CFO} + \mathrm{Int}(1 - \mathrm{Taxrate}) - \mathrm{FCInv}$$</td><td>NI – Net income
NCC – Non– cash charges (such as depreciation and amortisation)
Int – Interest expense
FCInv – Capital expenditures (fixed capital, such as equipment)
WCInv – Working capital expenditures</td></tr>
<tr><td></td><td>Free cash flow to equity (FCFE)</td><td>$$\mathrm{FCFE} = \mathrm{CFO} - \mathrm{FCInv} + \text{Net borrowing}$$
OR
$$\mathrm{FCFE} = \mathrm{CFO} - \mathrm{FCInv} - \text{Net debt repayment}$$</td><td>CFO – Cash flow from operations</td></tr>
<tr><td></td><td>Treatment of Temporary Differences</td><td><table>
<tr><th>Balance Sheet Item</th><th>If:</th><th>Treatment</th></tr>
<tr><td>Asset</td><td>Carrying amount > Tax base</td><td>Deferred tax liability</td></tr>
<tr><td>Asset</td><td>Carrying amount < Tax base</td><td>Deferred tax asset</td></tr>
<tr><td>Liability</td><td>Carrying amount > Tax base</td><td>Deferred tax asset</td></tr>
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</table></td><td></td></tr>
<tr><td></td><td>COGS Adjusted</td><td>$$\text{COGS (straight} - \text{line depreciation method)} - \text{Charges in inventory writedowns} - \text{Change in LIFO reserve}$$</td><td>COGS – Cost of Goods Sold
LIFO – Last In First Out</td></tr>
<tr><td></td><td>Net Income (Adjusted)</td><td>$$\text{Net Income (FIFO method)} + \text{Charges in inventory writedowns, after tax}$$</td><td>FIFO – First In First Out</td></tr>
<tr><td></td><td>Ending Inventory (FIFO)</td><td>$$\text{Endnig Inventory (LIFO)} + \text{LIFO Reserve}$$</td><td>LIFO – Last In First Out
FIFO – First In First Out</td></tr>
</table>

	Ending Retained Earnings	Beginning Retained Earnings + Net Income − Dividends		
	Estimated total useful life	Time elapsed since purchase(Age) + Estimated remaining life		
	Estimated total useful life	$\frac{\text{Historical Cost}}{\text{Annual depreciation expense}}$		
	Historical cost	Accumulated depreciation + Net PPE		
	Ratios	Profitability Ratios	$\text{Gross Profit Margin} = \frac{\text{Gross Profit}}{\text{Revenue}}$	
			$\text{Pretax margin} = \frac{\text{EBT}}{\text{Revenue}}$	EBT – Earnings before tax but after interest
			$\text{Net Profit Margin} = \frac{\text{Net Income}}{\text{Revenue}}$	

			$\text{Operating ROA} = \frac{\text{Operating income}}{\text{Average total assets}}$	
			$\text{ROA} = \frac{\text{Net Income}}{\text{Average total assets}}$	
			$\text{Return on invested capital} = \frac{\text{EBIT}(1 - \text{Effective Tax Rate})}{\text{Average total short and long term debt and equity}}$	
			$\text{ROE} = \frac{\text{Net income}}{\text{Average total equity}}$	
			$\text{Return on common equity} = \frac{\text{Net income} - \text{Preferred dividends}}{\text{Average common equity}}$	
			$\text{Operating Profit Margin} = \frac{\text{EBIT}}{\text{Revenue}}$	EBIT– Earnings Before Interest and Taxes
		Liquidity Ratios	$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$	
			$\text{Quick Ratio} = \frac{\text{Cash} + \text{Short term Marketable Investments} + \text{Receivables}}{\text{Current Liabilities}}$	

			$\text{Cash Ratio} = \dfrac{\text{Cash} + \text{Short term Marketable Investments}}{\text{Current Liabilities}}$	
			$\text{Defensive Interval Ratio} = \dfrac{\text{Cash} + \text{Short term Marketable Investments} + \text{Receivables}}{\text{Daily cash expenditures}}$	
			$\text{Cash Conversion Cycle (net operating cycle)} = \text{DSO} + \text{DOH} - \text{DPO}$	DSO – Days Sales Outstanding DOH – Days of Inventory at Hand DPO – Days Payables Outstanding
		Activity Ratios	$\text{Receivables Turnover} = \dfrac{\text{Annual Sales}}{\text{Average Receivables}}$	
			$\text{Inventory Turnover} = \dfrac{\text{COGS}}{\text{Average Inventory}}$	COGS – Cost of Goods Sold
			$\text{Payables Turnover} = \dfrac{\text{COGS}}{\text{Average Payables}}$	
			$\text{DSO} = \dfrac{\text{Number of days in period}}{\text{Receivables Turnover}}$	DSO – Days of Sales Outstanding
			$\text{DOH} = \dfrac{\text{Number of days in period}}{\text{Inventory Turnover}}$	DOH – Days of Inventory at Hand

			$$DPO = \frac{\text{Number of days in period}}{\text{Payables Turnover}}$$	DPO – Days of Payables Outstanding
			$$\text{Total Asset Turnover} = \frac{\text{Revenue}}{\text{Average total assets}}$$	
			$$\text{Fixed Asset Turnover} = \frac{\text{Revenue}}{\text{Average Fixed Assets}}$$	
			$$\text{Working Capital Turnover} = \frac{\text{Revenue}}{\text{Average Working Capital}}$$	
		Solvency Ratios	$$\text{Debt} - \text{to} - \text{asset ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$	
			$$\text{Debt} - \text{to} - \text{capital ratio} = \frac{\text{Total Debt}}{\text{Total Debt} + \text{Total shareholders'equity}}$$	
			$$\text{Debt} - \text{to} - \text{equity ratio} = \frac{\text{Total Debt}}{\text{Total shareholders'equity}}$$	
			$$\text{Financial leverage ratio} = \frac{\text{Total assets}}{\text{Total Equity}}$$	

			$\text{Debt}-\text{to}-\text{EBITDA} = \frac{\text{Total or net debt}}{\text{EBITDA}}$	EBITDA – Earnings before interest, taxes, depreciation, and amortization
			$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest payments}}$	EBIT – Earnings before interest and taxes
			$\text{Fixed charge coverage} = \frac{\text{EBIT} + \text{Lease payments}}{\text{Interest payments} +}$	
		Performance Ratios	$\text{Cash flow to Revenue} = \frac{\text{CFO}}{\text{Net Revenue}}$	CFO – Cash flow from operations
			$\text{Cash Return on Assets} = \frac{\text{CFO}}{\text{Average Total Assets}}$	CFO – Cash flow from operations
			$\text{Cash Return on Equity} = \frac{\text{CFO}}{\text{Average Shareholders' Equity}}$	CFO – Cash flow from operations
			$\text{Cash to Income} = \frac{\text{CFO}}{\text{Operating Income}}$	
			$\text{Cash Flow per Share} = \frac{(\text{CFO} - \text{Preferred Dividends})}{\text{Number of Common Shares Outstanding}}$	

		Coverage Ratios	$\text{Debt Coverage} = \frac{\text{CFO}}{\text{Total Debt}}$	
			$\text{Interest Coverage} = \frac{(\text{CFO} + \text{Interest paid} + \text{Taxes paid})}{\text{Interest Paid}}$	
			$\text{Reinvestment} = \frac{\text{CFO}}{\text{Cash paid for Long term Assets}}$	
			$\text{Debt Payment} = \frac{\text{CFO}}{\text{Cash paid for Long term Debt Payment}}$	
			$\text{Dividend Payment} = \frac{\text{CFO}}{\text{Dividends paid}}$	
			$\text{Investing and Financing} = \frac{\text{CFO}}{\text{Cash outflows for investing and financing activities}}$	
		DuPont Analysis	**Two - Component DuPont Equation** $\text{ROE} = \frac{\text{Net income}}{\text{Average shareholders' equity}} = \frac{\text{Net income}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$ $\therefore \mathbf{ROE = ROA \times Leverage}$	ROE – Return on Equity NI – Net Income

			Three-Component DuPont Equation $$\text{ROE} = \frac{\text{Net income}}{\text{Average shareholders' equity}}$$ $$= \frac{\text{Net income}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$$ $$= \frac{\text{Net income}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$$ $$\therefore \textbf{ROE} = \textbf{Net Profit margin} \times \textbf{Total asset turnover} \times \textbf{Leverage}$$	EBIT– Earnings Before Income and Taxes EBT – Earnings Before Tax
			Extended DuPont Equation $$\text{ROE} = \frac{\text{Net income}}{\text{Average shareholders' equity}}$$ $$= \frac{\text{Net income}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$$ $$= \frac{\text{Net income}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$$ $$= \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average shareholders' equity}}$$ $$\therefore \textbf{ROE} = \textbf{Tax burden} \times \textbf{Interest burden} \times \textbf{EBIT margin} \times \textbf{Total asset turnover} \times \textbf{Leverage}$$	
	Cash Conversion Cycle	$$\text{Cash Conversion Cycle} = \text{DOH} + \text{DSO} - \text{DPO}$$		DOH – Days of inventory on hand DSO – Days sales outstanding DPO – Days payable outstanding

	Effective Annual Rate of Supplier Financing	$\text{EAR of Supplier Financing} = \left(\left(1 + \frac{\text{Discount\%}}{100\% - \text{Discount\%}}\right)^{\frac{\text{Days in Year}}{\text{Payment Period} - \text{Discount Period}}}\right) - 1$	EAR – Effective Annual Rate
	Net Present Value (NPV)	$\text{NPV} = \sum_{t=0}^{T} \frac{CF_t}{(1+r)^t} = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_T}{(1+r)^T}$	CF_t – After tax cash flow at time t r – Required rate of return
	Project NPV with Real Options	$\text{Project NPV} = \text{NPV (without options)} - \text{Option cost} + \text{Option value}$	
	Return on Invested Capital (ROIC)	$\frac{\text{After} - \text{tax operating profit}_t}{\text{Average invested capital}} = \frac{(1 - \text{Tax Rate}) \times \text{Operating profit}}{\text{Average total long} - \text{term liabilities and equity}}$	
	Weight of Debt	$\frac{D}{E + D}$	D – Debt value E – Equity value
	Weight of Equity	$\frac{E}{E + D}$	D – Debt value E – Equity value
	WACC	$\text{WACC} = (\text{Cost of debt} \times \text{Weighting of debt}) + (\text{Cost of equity} \times \text{Weighting of Equity}$ $= [(1 - \text{Tax rate}) \times \text{Pre} - \text{tax cost of debt} \times \text{Weighting of debt}]$ $+ (\text{Cost of Equity} \times \text{Weighting of Equity})$ $= w_d r_d (1 - t) + w_e r_e$	WACC – Weighted Average Cost of Capital W_d, W_e – Proportion of debt, and equity that the company uses when it raises new funds r_d – Before– tax marginal cost of debt r_p – Marginal cost of equity t – Company's marginal tax rate

	MM Proposition I without Taxes	$V_L = V_U$	V_L – Value of the levered firm V_u – Value of the unlevered firm
	MM Proposition II without Taxes	$r_e = r_0 + (r_0 - r_d)\frac{D}{E}$	r_0 – Cost of capital for a company financed only by equity and has zero debt r_d – Cost of debt r_e – Cost of equity D/E – Debt– to– equity ratio
	MM Proposition I with taxes	$V_L = V_U + tD$	V_L – Value of the levered firm V_u – Value of the unlevered firm t – Marginal tax rate D – Value of debt in the capital structure
	MM Proposition II with taxes	$r_e = r_0 + (r_0 - r_d)(1 - t)\frac{D}{E}$	
	Value of a leveraged company	$V_L = V_U + tD - PV(\text{Costs of financial distress})$	V_u – Value of the unlevered firm t – Marginal tax rate D – Value of debt in the capital structure
	Operating profit	$\text{Operating Profit} = [Q \times (P - VC)] - FC$	Q – Units of output sold P – Price per unit of output VC – Variable costs FC – Fixed costs

	Retention Rate	$\text{Retention rate} = 1 - \frac{\text{Dividends declared}}{\text{Net income}}$	
	Sustainable Growth Rate	$g = b \times ROE$	g – Growth Rate b – Retention Rate ROE – Return on Equity
	Capital Asset Pricing Model (CAPM) Approach	$r_e = RFR + \beta[E(R_{mkt}) - RFR]$	r_e – Cost of equity RFR – Risk– free rate of an asset β – Sensitivity of a stock's return to changes in market return $E(R_{mkt})$ – Expected return on the market
	Bond yield plus risk premium method	$r_e = \text{bond yield} + \text{risk premium}$	r_0 – Cost of capital for a company financed only by equity and has zero debt r_d – Cost of debt r_e – Cost of equity D/E - Debt– to– equity ratio
	Estimating Beta	$\beta_{asset} = \beta_{debt} w_d + \beta_{equity} w_e$ $\beta_{asset} = \beta_{equity} \frac{1}{1 + (1-t)\frac{D}{E}}$ $\beta_{project} = \beta_{asset}\{1 + ((1 - t_{project})\frac{D_{project}}{E_{project}}$	W_d – Proportion of debt that the company uses when raising new capital W_e – Proportion of equity that the company uses when raising new capital D – Market value of debt E – Market value of equity t – Marginal tax rate

	Retention Rate	$$\text{Retention rate} = 1 - \frac{\text{Dividends declared}}{\text{Net income}}$$	
	Degree of Operating Leverage (DOL)	$$\text{DOL} = \frac{\%\text{ change in operating income}}{\%\text{ change in units sold}} = \frac{Q(P-V)}{Q(P-V)-F}$$	Q – Number of units P – Price per unit V – Variable operating costs F – Fixed operating costs Q (P – V)– Contribution margin
	Degree of Financial Leverage (DFL)	$$\text{DFL} = \frac{\%\text{ change in net income}}{\%\text{ change in operating income}} = \frac{Q(P-V)-F}{Q(P-V)-F-C}$$	Q – Number of units P – Price per unit V – Variable operating costs F – Fixed operating costs Q (P – V) – Contribution margin
	Degree of Total Leverage (DTL)	$$\text{DFL} = \text{DFL} \times \text{DOL}$$	DFL – Degree of Financial Leverage DOL - Degree of Operating Leverage
	Margin Call	$$P_o \times \left(\frac{(1-\text{initial margin}\%)}{1-\text{maintenance margin }\%}\right)$$	P_o – Current share price

EQUITY INVESTMENTS	Value of a Price Return Index	$V_{PRI} = \frac{\sum_{i=1}^{N} n_i P_i}{D}$	V_{PRI} – Value of a price index return n_i – Number of units of constituent security i in index portfolio N – Number of constituent securities in index P_i – Unit price of constituent security D – Value of the divisor
	Price Return of an Index (PR_I)	$PR_I = \frac{V_{PRI1} - V_{PRI0}}{V_{PRI0}}$	V_{PRI1} – Value of the price return index at end of period V_{PRI0} – Value of the price return index at the beginning of period
	Price Return of Each Constituent Security	$PR_i = \frac{P_{i1} - P_{i0}}{P_{i0}}$	PR_i – Price return of constituent security i (as a decimal number) P_{i1} – Price of constituent security i at the end of the period P_{i0} – Price of constituent security i at the beginning of the period
	Price Weighting	$w_i^P = \frac{P_i}{\sum_{i=1}^{N} P_i}$	P_i- Price of constituent security $\sum_{i=1}^{N} P_i$ – Sum of all the prices of the constituent securities.

	Price Return of an Index in the Index	$$PR_I = \sum_{i=1}^{N} w_i PR_i = \sum_{i=1}^{N} w_i \left(\frac{P_{i1} - P_{i0}}{P_{i0}}\right)$$	PR_I – Price return of index portfolio (as a decimal number) w_i – Weight of security i (the fraction of the index portfolio allocated to security i) N – Number of securities in the index
	Total Return of an Index (TR_I)	$$TR_I = \frac{V_{PRI1} - V_{PRI0} + Inc_I}{V_{PRI0}}$$	V_{PRI1} – Value of the price return index at the end of the project V_{PRI0} - Value of the price return index at the beginning of the project Inc_I – Total income from all securities in the index held over the period
	Total Return of Each Constituent Security in the Index	$$TR_i = \frac{P_{i1} - P_{i0} + Inc_i}{P_{i0}}$$	TR_i – Total return of constituent security i (as a decimal number) P_{i1} – Price of constituent security i at the end of the period P_{i0} – Price of constituent security i at the beginning of the period Inc_i – Total income (dividends and/or interest) from security i over the period

	Total Return of the Index Portfolio	$$TR_I = \sum_{i=1}^{N} w_i \, TR_i = \sum_{i=1}^{N} w_i \left(\frac{P_{i1} - P_{i0} + Inc_i}{P_{i0}}\right)$$	TR_i – Total return of constituent security i (as a decimal number) P_{i1} – Price of constituent security i at the end of the period P_{i0} – Price of constituent security i at the beginning of the period Inc_i – Total income (dividends and/or interest) from security i over the period N – Number of securities in the index w_i – Weight of security i (the fraction of the index portfolio allocated to security i)
	Calculation of Price Return Index Values Over Multiple Time Periods	$$V_{PRIT} = V_{PRI0}(1 + PR_{I1})(1 + PR_{I2}) \ldots (1 + PR_{IT})$$	V_{PRI0} – Value of the price return index at inception. V_{PRIT} – Value of the price return index at time t PR_{IT} – Price return (as a decimal number) on the index over period t, t = 1, 2, …, T
	Calculation of Total Return Index Values Over Multiple Time Periods	$$V_{PRIT} = V_{PRI0}(1 + TR_{I1})(1 + TR_{I2}) \ldots (1 + TR_{IT})$$	V_{PRI0} – Value of the total return index at inception. V_{PRIT} – Value of the total return index at time t TR_{IT} – Total return (as a decimal number) on the index over period t, t = 1, 2, …, T
	Equal Weighting	$$w_i^E = \frac{1}{N}$$	w_i – Weight of security i N – Number of securities in the index

	Market Capitalization Weighting	$$w_i^M = \frac{Q_iP_i}{\sum_{j=1}^{N} Q_jP_j}$$	w_i – Weight of security i Q_i– Number of shares outstanding of security i P_i– Share price of security i N – Number of securities in index
	Float-adjusted Market Capitalization	$$w_i^M = \frac{f_iQ_iP_i}{\sum_{j=1}^{N} f_iQ_iP_i}$$	f_i– Fraction of shares outstanding in the market float w_i – Weight of security i Q_i – Number of shares outstanding of security i P_i – Share price of security i N – Number of securities in index
	Fundamental weighting	$$w_i^F = \frac{F_i}{\sum_{j=1}^{N} F_j}$$	F_i – Fundamental size measure of company i.
	Return on Equity (ROE)	$$ROE_t = \frac{NI_t}{\text{Average } BVE_t} = \frac{NI_t}{(BVE_t + BVE_{t-1})/2}$$	NI – Net income BVE – Book value of equity
	Herfindahl-Hirschman Index (HHI)	$$HHI = \sum_{i=1}^{\infty} s_i^2$$	s – Market share of market participant stated as a whole number
	Price– to– book ratio	$$\text{Price to book ration} = \frac{\text{Market price per share}}{\text{BV per share}}$$	BV – Book value of equity/share $$BV = \frac{\text{Shareholder's equity}}{\text{Shares Outstanding}}$$

	Price– to– sales ratio	$\text{Price to sales ratio} = \frac{\text{Market price per share}}{\text{Sales per share}}$	
	Price– to– cash– flow ratio	$\text{Price to cash flow ratio} = \frac{\text{Market price per share}}{\text{Cash flow per share}}$	
	Price– to– earnings ratio (Trailing)	$\text{Price to earnings ratio (Trailing)} = \frac{\text{Market price per share}}{\text{EPS previous 12 months}}$	EPS – Earnings Per Share
	Price– to– earnings ratio (Forward)	$\text{Price to earnings ratio (Forward)} = \frac{\text{Market price per share}}{\text{EPS forecast for 12 months}}$	EPS – Earnings Per Share
	One– Period DDM	$P_o = \frac{D_1}{1+r} + \frac{P_1}{(1+r)^2}$	D_1 – Dividend one period ahead P_1 – Price at the end of year 1 (Terminal Value)
	Intrinsic Value of a Share (Assuming Constant Required Rate of Return and Company being Going Concern)	$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$	V_0 – Value of a share of stock today, at t = 0 D_t – expected dividend in year t, assumed to be paid at the end of the year r – Required rate of return on the stock
	DDM for Pricing Share for n-holding Periods	$V_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \cdots \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$ $= \sum_{t=1}^{n} \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$	D_{n+1}– Dividends in year n+1 g_s – growth rate (short term) P_n – Price at $t = n$ (Terminal Value)

	Value of non-callable, non-convertible perpetual preferred share paying a level dividend D and assuming a constant required rate of return over time	$V_0 = \frac{D_0}{r}$	V_0 – Current value or price of the preferred share. D_0 – Current dividend per period. r – Required rate of return on the stock
	Intrinsic Value of Non-callable, Non-Convertible Preferred Stock with Maturity at time n.	$V_0 = \sum_{t=1}^{n} \frac{D_t}{(1+r)^t} + \frac{F}{(1+r)^n}$	
	Value of Company's Equity using FCFE	$V_0 = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1+r)^t}$	FCFE – Free Cash Flow to Equity r – Required rate of return
	Gordon (Constant) Growth Model	$V_0 = \frac{D_1}{r-g}$	D_1– Dividends at time 1 r – Required rate of return g – Constant growth rate

	Multistage GGM	$$V_o = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \cdots \frac{D_n}{(1+r)^n} + \frac{V_n}{(1+r)^n}$$ $$= \sum_{t=1}^{n} \frac{D_0(1+g_S)^t}{(1+r)^t} + \frac{V_n}{(1+r)^n}$$ Where: $$V_n = \frac{D_{n+1}}{r-g_L}$$ $$D_{n+1} = D_o(1+g_S)^n(1+g_L)$$	D_{n+1}– Dividends in year n+1 g_S – Growth rate (short– term) g_L – Growth rate (long– term) V_n– Intrinsic value per share in year n D_o – Current dividend/Historical dividend VALUE
	Justified Forward P/E ratio	$$\frac{P_0}{E_1} = \frac{\text{Expected DPS}}{r-g} = \frac{D_1/E_1}{r-g} = \frac{p}{r-g}$$	Expected DPS – Expected dividends per share g – Sustainable growth rate r– Required rate of return D_1 – Expected dividends E_1 – Expected earnings p – dividend payout ratio
	Sustainable Growth Rate	$$g = b \times ROE$$	g – Growth Rate b – Retention Rate ROE – Return on Equity
	Enterprise Value (EV)	$$EV = \text{MV of common stock} + \text{MV of debt} - \text{Cash and short term investements}$$	EV – Enterprise Value MV – Market Value
	Periodic Payment (A) of Fully Amortizing Loan	$$A = \frac{r \times \text{Principal}}{1-(1+r)^{-N}}$$	r – Market interest rate per period A – Periodic payment amount N – Number of payment periods Principal – Principal amount

FIXED INCOME	Floating Rate Note Coupon	$\text{FRN coupon} = \text{MRR} + \text{Credit Spread}$	MRR – Market reference rate, stated as an annual percentage rate (it is sometimes known generically as Index)
	Conversion ratio	$\text{Conversion ratio} = \dfrac{\text{Convertible bond per value}}{\text{Conversion price}}$	
	Conversion value	$\text{Conversion value} = \text{Conversion ratio} \times \text{Current share price}$	
	Initial Margin	$\text{Initial Margin} = \dfrac{\text{Security price}_0}{\text{Purchase price}_0}$	Security price_0 – Market value of the security at the time of the initial transaction. Purchase price_0 – Price at which the investor agrees to buy the security at the time of the initial transaction.
	Haircut	$\text{Haircut} = \dfrac{\text{Security price}_0 - \text{Purchase price}_0}{\text{Security price}_0}$	
	Variation Margin	$\text{Variation Margin} = (\text{Initial Margin} \times \text{Purchase Price}_t) - \text{Security Price}_t$	Security price_t – Market value of the security at $T = t$ Purchase price_0 – Price at which the investor agrees to buy the security at $T = t$.
	Price (PV) of a Coupon Bond	$PV = \dfrac{PMT_1}{(1+r)^1} + \dfrac{PMT_2}{(1+r)^2} + \cdots + \dfrac{(PMT_N + FV_N)}{(1+r)^N}$	PV – Price of the bond. PMT – Coupon payment r – Market discount per period. FV – Bond's face value N – Number of periods to maturity

	Full Price or Dirty Price	$PV^{full} = PV^{flat} + AI$	PV^{full} – Full price PV^{flat} – Flat price AI – Accrued interest
	Accrued Interest (AI)	$\frac{t}{T} \times PMT$	t – Number of days from last coupon payment to settlement date T – Number of days in coupon period PMT – Coupon payment per period
	Full Price (PV^{full})	$PV^{full} = PV \times (1+r)^{\frac{t}{T}}$ Where: $PV = \frac{PMT_1}{(1+r)^1} + \frac{PMT_2}{(1+r)^2} + \cdots + \frac{(PMT_N + FV_N)}{(1+r)^N}$	PV – Price of the bond. r – Market discount per period. t – Number of days from last coupon payment to settlement date T – Number of days in coupon period
	Conversion of an Annualized Yield using One Periodicity to another Periodicity	$\left(1+\frac{APR_m}{m}\right)^m = \left(1+\frac{APR_n}{n}\right)^n$	APR_m – annual percentage rate for m periods per year APR_n – annual percentage rate for m periods per year
	Current Yield (CY)	$CY = \frac{\text{Annual Coupon}_t}{\text{Price}_t}$	

	Yield-to-Call	$$PV = \frac{PMT_1}{(1+r)^1} + \frac{PMT_2}{(1+r)^2} + \cdots + \frac{(PMT_N + \text{Call price})}{(1+r)^N}$$	PV – Price of the bond. PMT – Coupon payment per period Call price – Price at which a bond can be called on a given date r – Yield per period or market discount rate FV – Bond's face value N – Number of evenly spaced periods to the date when a bond can be called at the call price
	Yield Spreads	Def: The **yield spread** is the difference between the yield-to-maturity and the benchmark yield. **Benchmark Spread** = Yield spread over a specific benchmark (Risk premium for the credit and liquidity risks and possibly the tax impact of holding a specific bond.) **G – spread** = Yield spread in basis points over an actual or interpolated government bond yield (return for bearing risks relative to the sovereign bond) **I – Spread** = Interpolated yield spread for a bond over the standard swap rate in that currency of the same tenor (comparison against a short-term market-based reference rate) **Z – Spread** = zero-volatility, constant yield spread over a government (or interest rate swap) spot curve, or series of yields. **Option-Adjusted Spread (OAS)** = Z-spread – Option value in basis points per year (yield spread based on an option-pricing model and an assumption about future interest rate volatility.) i.e OAS = Z-spread – Option value in basis points per year.	
	Z-Spread Over the Benchmark Spot Curve	$$PV = \frac{PMT}{(1+z_1+Z)^1} + \frac{PMT}{(1+z_2+Z)^2} + \cdots + \frac{PMT + FV}{(1+z_N+Z)^N}$$	z_1, z_2, z_N – Benchmark spot or zero rates PMT – Coupon payment per period FV – Future value

	PV of Floating Rate Notes	$$\frac{\frac{(\mathrm{MRR}+\mathrm{QM})\times \mathrm{FV}}{\mathrm{m}}}{\left(1+\frac{\mathrm{MRR}+\mathrm{DM}}{\mathrm{m}}\right)^{1}}+\frac{\frac{(\mathrm{MRR}+\mathrm{QM})\times \mathrm{FV}}{\mathrm{m}}}{\left(1+\frac{\mathrm{MRR}+\mathrm{DM}}{\mathrm{m}}\right)^{2}}+\cdots\frac{\frac{(\mathrm{MRR}+\mathrm{QM})\times \mathrm{FV}}{\mathrm{m}}}{\left(1+\frac{\mathrm{MRR}+\mathrm{DM}}{\mathrm{m}}\right)^{N}}$$	PV – Present value, or the price of the floating– rate note Index – Reference rate, stated as an annual percentage rate QM – Quoted margin, stated as an annual percentage rate FV – Future value paid at maturity, or the par value of the bond m – Periodicity of the floating–rate note, the number of payment periods per year DM – Discount margin, the required margin stated as an annual percentage rate N – Number of evenly spaced periods to maturity
	Money Market Instruments Pricing Quoted on Discount Rate (DR) Basis	$$\mathrm{PV}=\mathrm{FV}\times\left(1-\frac{\mathrm{Days}}{\mathrm{Years}}\times \mathrm{DR}\right)$$	PV – Price of the money market instrument FV – Face value of the money market instrument Days – Number of days between settlement and maturity Year – Number of days in the year DR – The discount rate

	Money Market Instruments Pricing Quoted on an Add-on Rate Basis	$PV = \frac{FV}{\left(1 + \frac{Days}{Year} \times AOR\right)}$	PV – Price of the money market instrument FV – Face value of the money market instrument Days – Number of days between settlement and maturity Year – Number of days in the year AOR – The add-on rate
	Bond Pricing Using Spot Rates	$PV = \frac{PMT}{(1+Z_1)^1} + \frac{PMT}{(1+Z_2)^2} + \cdots + \frac{PMT + FV}{(1+Z_N)^N}$	Z_1 – Spot rate, or zero-coupon yield or zero rate, for period 1 Z_2 – Spot rate, or zero-coupon yield or zero rate, for period 2 Z_N – Spot rate, or zero-coupon yield or zero rate, for period N
	Calculating Implied Forward Rates using Spot Rates	$(1 + Z_A)^A \times \left(1 + IFR_{A,B-A}\right)^{B-A} = (1 + Z_B)^B$	Z_A – Shorter-term spot rates. Z_B – Longer-term spot rate. $IFR_{A,B-A}$ – Implied forward rate for a security begins at t = A and matures at t = B (tenor B – A).
	Interpreting Forward Rate	Example: "4y2y" is read as "four-year into two-year rate **Implication:** First number is the length of the shorter spot rate, and the second number is the tenor of the implied forward rate. 4y2y can be written as: $4y2y = (1 + Z_4)^4 \times \left(1 + IFR_{4,2}\right)^2 = (1 + Z_6)^6$	
	Duration Gap	$\text{Duration gap} = \text{Macaulay duration} - \text{Investment horizon}$	

	MacDur	$$\text{MacDur} = \left\{\left(1-\frac{t}{T}\right)\left[\frac{\frac{\text{PMT}}{(1+r)^{1-\frac{t}{T}}}}{\text{PV}^{\text{Full}}}\right] + \left(2-\frac{t}{T}\right)\left[\frac{\frac{\text{PMT}}{(1+r)^{2-\frac{t}{T}}}}{\text{PV}^{\text{Full}}}\right] + \cdots + \left(N-\frac{t}{T}\right)\left[\frac{\frac{\text{PMT}}{(1+r)^{N-\frac{t}{T}}}}{\text{PV}^{\text{Full}}}\right]\right\}$$	t – Number of days from the last coupon payment to the settlement date T – Number of days in the coupon period t/T – Fraction of the coupon period that has passed since the last payment PMT – Coupon payment per period FV – Future value paid at maturity, or the par value of the bond r – Yield-to-maturity per period N – Number of evenly spaced periods to maturity as of the beginning of the current period.
	MacDur (Closed Form)	$$\text{MacDur} = \left\{\frac{1+r}{r} + \frac{1+r+[N \times (c-r)]}{c \times [(1+r)^N - 1 + r]}\right\} - \frac{t}{T}$$	r – Yield-to-maturity per period N – Number of evenly spaced periods to maturity as of the beginning of the current period c – Coupon rate per period t – Number of days from the last coupon payment to the settlement date T – Number of days in the coupon period.

	Modified Duration	$\text{ModDur} = \dfrac{\text{MacDur}}{(1+r)}$	
	Percentage Price Change for a Bond given a Change in its Yield-to-Maturity using Modified Duration	$\%\Delta PV^{full} \approx -\text{AnnModDur} \times \Delta\text{AnnYield}$	AnnModDur – Annualized modified duration. ΔAnnYield – Change in annualized yield-to-maturity.
	Approximate Modified Duration	$\text{AnnModDur} \approx \dfrac{(PV_{-}) - (PV_{+})}{2 \times (\Delta\text{Yield}) \times (PV_0)}$	(PV_{-}) and (PV_{+}) – Change in bond price due decrease and increase in yield-to-maturity by the same amount, respectively. ΔYield – Change in yield-to-maturity. PV_0 – Quoted full price of the bond
	Approximate Macaulay Duration	$\text{AnnMacDur} \approx \text{AnnModDur} \times (1 + r)$	AnnMacDur – Approximate modified duration AnnModDur – Approximate modified duration. r – Yield per period.
	Money Duration	$\text{MoneyDur} = \text{AnnModDur} \times PV^{full}$	MoneyDur – Money duration AnnModDur – Annualized Modified Duration
	Percentage Price using Money Duration Estimates the Change in Currency Units.	$\%\Delta PV^{full} \approx -\text{MoneyDur} \times \Delta\text{Yield}$	ΔYield – Change in yield-to-maturity.

	Modified Duration	$\text{ModDur} = \frac{\text{MacDur}}{(1 + \text{YTM})}$	MacDur – Macaulay Duration YTM – Yield– To– Maturity
	Price Value of Basis Point	$\text{PVBP} = \frac{\text{PV}_{-} - \text{PV}_{+}}{2}$	PV_{-} – Price of bond due to a 0.01% **decrease** in the YTM PV_{+}– Price of bond due to a 0.01% **increase** in the YTM
	Macaulay Duration of a Zero-Coupon Bond	$\text{MacDur} = \text{Time to Maturity}$	
	Macaulay Duration of Perpetual Bond	$\text{MacDur} = \frac{(1 + \text{r})}{\text{r}}$	r – Yield per period
	Macaulay Duration of Floating-Rate Notes and Loans	$\text{MacDur}_{\text{Floating}} = \frac{(\text{T} - \text{t})}{\text{T}}$	T – Total time-to-maturity t – Time that have passed since the last coupon
	% Price Change of a Bond Using Modified Duration and Convexity	$\%\Delta\text{PV}_{\text{full}} \approx (-\text{AnnModDur} \times \Delta\text{Yield}) + \left[\frac{1}{2} \times \text{AnnConvexity} \times (\Delta\text{Yield})^2\right]$	AnnModDur – Annualized Modified Duration AnnConvexity – Annualized Convexity ΔYield – Change in yield-to-maturity
	Approximate Convexity	$\text{ApproxCon} = \frac{(\text{PV}_{-}) + (\text{PV}_{+}) - [2 \times (\text{PV}_0)]}{(\Delta\text{Yield})^2 \times (\text{PV}_0)}$	(PV_{-}) and (PV_{+}) – Change in bond price due decrease and increase in yield-to-maturity by the same amount, respectively. ΔYield – Change in yield-to-maturity. PV_0 – Quoted full price of the bond

	Money Convexity	$\text{MoneyCon} = \text{AnnConvexity} \times \text{PV}^{\text{Full}}$	
	Approximate Percentage Change using Money Duration and Money Convexity	$\%\Delta \text{PV}_{\text{full}} \approx -(\text{MoneyDur} \times \Delta\text{Yield}) + \left[\frac{1}{2} \times \text{MoneyCon} \times (\Delta\text{Yield})^2\right]$	
	Approximate Effective Duration	$\text{EffeDur} \approx \frac{(\text{PV}_-) - (\text{PV}_+)}{2 \times (\Delta\text{curve}) \times (\text{PV}_o)}$	Δcurve – Change in the yield curve
	Approximate Effective Convexity	$\text{EffeD} \approx \frac{[(\text{PV}_-) + (\text{PV}_+)] - [2 \times (\text{PV}_0)]}{(\Delta\text{curve})^2 \times (\text{PV}_o)}$	
	Percentage Change in a Bond's Full Price for a Given Shift in the Benchmark Yield Curve (ΔCurve)	$\%\Delta \text{PV}_{\text{full}} \approx (-\text{EffDur} \times \Delta\text{Curve}) + \left[\frac{1}{2} \times \text{EffCon} \times (\Delta\text{Curve})^2\right]$	
	Key Rate Duration	$\text{KeyRateDur}_k = -\frac{1}{\text{PV}} \times \frac{\Delta\text{PV}}{\Delta r_k}$	r_k – kth key rate
	Relationship between Key Rate Duration and Effective Duration	$\text{EffDur} = \sum_{k=1}^{n} \text{KeyRateDur}_k$	EE – Expected exposure RR – Recovery rate

	Expected Loss (EL)	Expected Loss (EL) = Probability of default (POD) × Loss given default (LGD)	
	Credit Spread	$\text{Credit Spread} \approx \text{POD} \times \text{LGD}$	POD – Probability of Default LGD – Loss Given Default
	Impact of Yield Spread on Bond's Price	$\%\Delta \text{PV}^{\text{Full}} = -\text{AnnModDur} \times \Delta\text{Spread}$	
	Impact of Yield Spread on Bond's Price, Incorporating Convexity Effect	$\%\Delta \text{PV}^{\text{Full}} = -(\text{AnnModDur} \times \Delta\text{Spread}) + \frac{1}{2} \times \text{AnnConvexity} \times (\Delta\text{Spread})^2$	
	Loan-to-value ratio (LTV)	$\text{LTV} = \frac{\text{Amount of the loan or Mortgage}}{\text{Property's value}}$	
	Debt Service Coverage Ratio (DSCR)	$\text{DSCR} = \frac{\text{Net Operating Income}}{\text{Debt Service}}$	
	Net Operating Income (NOI)	$\text{NOI} = (\text{Rental income} - \text{Cash operating income}) - \text{replacement reserves}$	
	Call option buyer's payoffs at expiration	$c_T = \text{Max}(0, S_T - X)$	S_T – Underlying spot price at time t = T X – Exercise price

	Call buyer's profit	$\Pi = \text{Max}(0, S_T - X) - c_0$	S_T – Underlying spot price at time t = T X – Exercise price
DERIVATIVES	Call option seller's payoffs at expiration	$-c_T = -\text{Max}(0, S_T - X)$	S_T – Underlying spot price at time t = T X – Exercise price
	Call seller's profit	$\Pi = -\text{Max}(0, S_T - X) + c_0$	S_T – Underlying spot price at time t = T X – Exercise price
	Payoff to the put holder	$p_T = \text{Max}(0, X - S_T)$	S_T – Underlying spot price at time t = T X – Exercise price
	Put buyer's profit.	$\Pi = \text{Max}(0, X - S_T) - P_o$	S_T – Underlying spot price at time t = T X – Exercise price P_o – Price of the put option
	Payoff for the seller	$-p_T = -\text{Max}(0, X - S_T)$	S_T – Underlying spot price X – Exercise price
	Put seller's profit	$\Pi = -\text{Max}(0, X - S_T) + P_0$	S_T – Underlying spot price X – Exercise price P_o – Price of the put option
	Call Option Time Value	$\text{Time Value} = c_t - \text{Max}(0, S_t - X(1 + r)^{-(T-t)})$	c_t – Call option price at time T=t

	Put Option Time Value	$\text{Time Value} = p_t - \text{Max}\left(0,\ X(1+r)^{-(T-t)} - S_t\right)$	p_t – Put option price at time T=t
	Lower and Upper Bounds of a Call Option Price	$c_t, \text{Lower bound} = \text{Max}\left(0, s_t - X(1+r)^{-(T-t)}\right)$ $c_t, \text{Upper bound} = s_t$	
	Lower and Upper Bounds of a Put Option Price	$c_t, \text{Lower bound} = \text{Max}\left(0,\ X(1+r)^{-(T-t)} - S_t\right)$ $c_t, \text{Upper bound} = X$	
	Forward Price at time = T, with no associated Costs or Benefits	$F_0(T) = S_0(1+r)^T$	S_0 – Underlying spot price at time t = 0 $F_0(T)$ – Forward price of the underlying at time T. r – Risk-free rate
	Forward Price at time = T, with no associated Costs or Benefits, Assuming Continuous Compound	$F_0(T) = S_0e^{rT}$	S_0 – Underlying spot price at time t = 0 $F_0(T)$ – Forward price of the underlying at time T. r – Risk-free rate
	Forward Price at time t = T, with associated Costs or Benefits	$F_0(T) = [S_0 - PV_0(I) + PV_0(C)](1+r)^T.$	$PV_0(I)$ – Present value of income $PV_0(C)$ – Present value of Costs

	Forward Price at time = T, with associated Costs or Benefits, Assuming Continuous Compound	$F_0(T) = S_0 e^{(r+c-i)T}$	i –Income expressed as rates of return. c – Cost expressed as rates of return
	Forward Contract Value at Initiation	$V_0(T) = 0$	
	Payoff Profile of a Forward Contract	**Scenario** / **Buyer Payoff (Long Position), $V_T(T)$** / **Seller Payoff (Short Position), $V_T(T)$** $S_T > F_0(T)$ / $[S_T - F_0(T)] > 0$ / $[F_0(T) - S_T] < 0$ $S_T < F_0(T)$ / $[S_T - F_0(T)] < 0$ / $[F_0(T) - S_T] > 0$	S_T – Spot price of the underlying at time T $F_0(T)$ – Forward price of the underlying at time T.
	Price of Forward Contract during the Life of the Contract, at any time T = t, with no associated Costs	Long Position: $V_t\,(T) = S_t - F_0(T)(1+r)^{-(T-t)}$ Short Position: $V_t\,(T) = F_0(T)(1+r)^{-(T-t)} - S_t$	
	Price of Forward Contract during the Life of the Contract, at any time T = t, with associated Costs	Long Position: $V_t\,(T) = (S_t - PV_t(I) + PV_t(C)) - F_0(T)(1+r)^{-(T-t)}$ Short Position: $V_t\,(T) = F_0(T)(1+r)^{-(T-t)} - (S_t - PV_t(I) + PV_t(C))$	$PV_t(I)$ – Present value of the associated income at time t $V_t(C)$ – Present value of the associated costs at time t
	Net Payment of Forward Rate Agreement	Net Payment $= (MRR_{B-A} - IFR_{A,B-A}) \times$ Notional Principal $\times$ Period	MRR_{B-A} – market reference rate for B − A periods, which ends at time B $IFR_{A,B-A}$ – Implied forward rate for a security begins at t = A and matures at t = B (tenor B – A).

	Value of Futures Contract at Initiation	$V_0(T) = 0$	
	Value of Futures Contract at Initiation with no Associated Costs or Benefits Assuming Discrete Compounding	$f_0(T) = S_0(1 + r)^T$	$f_0(T)$ – Futures price S_0 – Underlying spot price at time t = 0 r – Risk-free rate of interest T – Time to maturity
	Value of futures Contract at Initiation with no Associated Costs or Benefits assuming Continuous Compounding	$f_0(T) = S_0 e^{rT}$	
	Value of Futures Contract at Initiation with associated Costs and Benefits assuming Discrete Compounding	$f_0(T) = [S_0 - PV_0(I) + PV_0(C)](1 + r)^T$	$f_0(T)$ – Futures price $PV_0(I)$ – Present value of income $PV_0(C)$ – Present value of Costs r – Risk-free rate of interest T – Time to maturity
	Futures Contract Basis Point Value (BPV)	$\text{Futures Contract BPV} = \text{Notional Principal} \times 0.01\% \times \text{Period}$	

Periodic Settlement Value of a Swap Contract	Periodic settlement value $=$ (MRR $- s_N$) $\times$ Notional amount $\times$ Period.	MRR – Market Reference Rate s_N – Swap rate for N periods
Call Option Exercise Value	$\text{Max}\left(0, S_T - X(1+r)^{-(T-t)}\right)$	S_T – Underlying spot price X – Exercise price
Put Option Exercise Value	$\text{Max}\left(0, X(1+r)^{-(T-t)} - S_t\right)$	S_T – Underlying spot price X – Exercise price
Put– call parity	$S_o + p_0 = c_0 + X(1+r)^{-T}$	c_o– Price of the call option S_0 – Underlying spot price at time t = 0 p_o– Price of the put option r_f– Risk– free interest rate T– Time to maturity K – Strike Price
Covered Call Position	$S_o - c_0 = X(1+r)^{-T} - p_0$	
Put– call forward parity	$F_0(T)(1+r)^{-T} + p_0 = c_0 + X(1+r)^{-T}$	c_o– Price of the call option $F_o(T)$ – Forward price of the asset at time T (maturity) p_o– Price of the put option r– Risk– free interest rate T– Time to maturity K – Strike Price

Hedge Ratio (Call Option)	$$h = \frac{c_1^u - c_1^d}{s_1^u - s_1^d}$$	c_1^u – Call option value if underlying price moves up. c_1^d – Call option value if underlying price moves down. s_1^u – Increased value of the underlying, due to up movement s_1^d – Decreased value of the underlying, due to down movement
Hedge Ratio (Put Option)	$$h = \frac{p_1^u - p_1^d}{s_1^u - s_1^d}$$	p_1^u – Put option value if underlying price moves up. p_1^d – Put option value if underlying price moves down. s_1^u – Increased value of the underlying, due to up movement s_1^d – Decreased value of the underlying, due to down movement
Value of a Call Option Today Using Arbitrage Pricing (One	$$c_0 = h \times S_0 - V_1(1+r)^{-1}$$ Where: $$V_1 = h \times R_u S_0 - c_1^u = h \times R_d S_0 - c_1^d$$	V_1 – Total portfolio value on up or down move of underlying price h – Hedge ratio S_0 – Underlying spot price at time t = 0 r– Risk– free interest rate

Value of a Put Option Today Using Arbitrage Pricing	$c_0 = V_1(1+r)^{-1} - h \times S_0$ Where: $V_1 = h \times R_u S_0 + p_1^u = h \times R_d S_0 + p_1^d$	V_1 – Total portfolio value on up or down move of underlying price h – Hedge ratio S_0 – Underlying spot price at time t = 0 r– Risk– free interest rate
Risk-Neutral Probability	$\pi = \frac{1 + r - R^d}{R^u - R^d}$	R^u – gross return from an up price move R^d – gross return from a down price move r– Risk– free interest rate
Value of call option Today (c_0) Using Risk Neutral Pricing	$c_0 = \frac{\pi c_1^u + (1-\pi)c_1^d}{(1+r)^T}$	c_1^u – Call option value if underlying price moves up. c_1^d – Call option value if c_0 – Value of call option today π – Risk neutral probability r – risk-free rate of interest T – Time to maturity
Value of Put option Today (p_0) Using Risk Neutral Pricing	$p_0 = \frac{\pi p_1^u + (1-\pi)p_1^d}{(1+r)^T}$	p_1^u – Put option value if underlying price moves up. p_1^d – Put option value if underlying price moves down. p_0 – Value of put option today π – Risk neutral probability r – risk-free rate of interest T – Time to maturity
Management fee	$NAV_{new} \times \text{fee } \%$	NAV– Net Asset Value

	GP's Rate of Return (r_{GP}) ignoring Management Fees and assuming a Single-period Fund Rate of Return of r	$r_{GP} = \max[0, p(r - r_h)]$	r_{GP} – GP's Rate of Return p – GP performance fee) as a percentage of total return r_h – Hurdle rate r – Single period fund rate return
ALTERNATIVE INVESTMENTS	GP's Rate of Return (r_{GP}) ignoring Management Fees and assuming a Single-period Fund Rate of Return of r under Catch Clause	$r_{GP} = \max[0, r_{cu} + p(r - r_h - r_{cu})]$	r_{cu} – Catch-up return
	MOIC	$\text{MOIC} = \frac{\text{Realized value of investment} + \text{Unrealized value of investment}}{\text{Total amount of invested capital}}$	MOIC
	Leveraged Rate of Return (r_L)	$r_L = \frac{\text{Leveraged portfolio return}}{\text{Cash position}} = \frac{[r \times (V_c + V_b) - (V_b \times r_b)]}{V_c} = r + \frac{V_b}{V_c(r - r_b)}$	r_L – Leveraged rate of return V_c – Cash investment V_b – Value of borrowed funds r – Cash Portfolio Return
	GP's Return in Currency Terms (R_{GP})	$R_{GP} = (P_1 \times r_m) + \max[0, (P_1 - P_0) \times p]$	P_1 – End-of-period assets P_0 – Beginning-of-period assets r_m – fixed GP management fees as a percentage of assets under management (AUM) p – GP performance fee

	Investor's periodic rate of return	$r_i = \dfrac{P_1 - P_0 - R_{GP}}{P_0}$	P_1 – End of period assets P_0 – Beginning of period assets R_{GP} – GP's return in currency terms
	GP's Return in Currency Terms (R_{GP}) where Performance Fee is Calculated Net of the Management fee	$R_{GP} = (P_1 \times r_m) + \max[0, (P_1(1 - r_m) - P_0) \times p]$	P_1 – End-of-period assets P_0 – Beginning-of-period assets r_m – F ixed GP management fees as a percentage of assets under management (AUM) p – GP performance fee