

CFA LEVEL I • CALCULATOR GUIDE

Texas BA II Plus Calculator Guide

Every Keystroke for Every Calculation

Step-by-step TI BA II Plus keystrokes with verified worked examples across Quantitative Methods, Fixed Income, Equity, Portfolio Management, Corporate Issuers, Financial Statement Analysis and Derivatives.

11 Chapters • Hyperlinked Navigation • Keystroke Tables • Worked Examples

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Quick Reference & Exam-Day Traps





Calculator Setup & Essentials

Configure the TI BA II Plus once, learn the clearing keys and the everyday functions every chapter relies on

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [One-Time Setup — Do This Before You Study](#)
- [Everyday Keys — Powers, Logs, Memory & Counting](#)

One-Time Setup — Do This Before You Study

SETUP

Five settings that decide whether your answers are right

Keystrokes	Display	What it means
Reset to factory defaults: [2ND] [RESET] [ENTER]	RST 0.00	Clears every worksheet & memory — also do this at the start of the exam
Decimal places: [2ND] [FORMAT] 9 [ENTER] [2ND] [QUIT]	DEC = 9	9 = floating decimal; avoids rounding traps in multi-step problems
Algebraic (BODMAS) mode: [2ND] [FORMAT] [↓] [↓] [↓] [↓] [2ND] [SET] until AOS, then [2ND] [QUIT]	AOS	3 [+] 2 [×] 4 [=] gives 11 in AOS but 20 in Chain (Chn). This guide assumes AOS
Payments & compounding per year: [2ND] [P/Y] 1 [ENTER] [↓] C/Y 1 [ENTER] [2ND] [QUIT]	P/Y = 1, C/Y = 1	Factory default is 12! With 1, you enter periodic N and I/Y yourself
Ordinary annuity (END): [2ND] [BGN] [2ND] [SET] until END, [2ND] [QUIT]	no “BGN” shown	A small “BGN” on the display means annuity-due mode is still on

KEY-WORD CLUSTER

Clearing the Right Thing — the #1 source of silly errors

Everyday clearing

- [CE/C]** clears the current entry / error message
- [2ND] [QUIT]** exits any worksheet to standard mode
- [2ND] [CLR TVM]** resets N, I/Y, PV, PMT, FV to zero

Inside a worksheet

- [2ND] [CLR WORK]** clears the open worksheet (CF, DATA, AMORT, DEPR, ICONV...)
- Clear TVM before EVERY TVM problem — old PMT or FV values silently stay stored
- Sign convention: cash out = negative, cash in = positive

Everyday Keys — Powers, Logs, Memory & Counting

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KEY FUNCTIONS

Keystrokes you will use in every subject

Function	Keystrokes	Example	Result
Power y^x	1.05 [y ^x] 3 [=]	1.05 ³	1.157625
n-th root (power 1/n)	1.012 [y ^x] 3 [1/x] [=]	$\sqrt[3]{1.012}$	1.003984
Square / square root	1.04 [x ²] 188.8 [√x]	1.04 ² ; $\sqrt{188.8}$	1.0816; 13.7405
Exponential e^x	0.36 [2ND] [e ^x]	e ^{0.36}	1.433329
Natural log	1.12 [LN]	ln(1.12)	0.113329
Reciprocal	20 [1/x]	1 ÷ 20	0.05
Store / recall memory	25.92 [STO] 1 ... [RCL] 1	M1 = 25.92	Ten memories: M0 – M9
Add display to memory	4.85 [STO] [+] 1	M1 = M1 + 4.85	Ideal for summing PVs
Previous answer	[2ND] [ANS]	—	Re-uses the last result
Factorial	5 [2ND] [x!]	5!	120
Combination / permutation	10 [2ND] [nCr] 3 [=] 10 [2ND] [nPr] 3 [=]	${}_{10}C_3$; ${}_{10}P_3$	120 ; 720
Days between two dates	[2ND] [DATE] DT1 [ENTER] [↓] DT2 [ENTER] [↓] [CPT]	Dates as MM.DDYY	DBD = day count
View all memories	[2ND] [MEM] then [↓]	M0 ... M9	Clear with [2ND] [CLR WORK]

EXAM TIP Store long intermediate results with [STO] instead of re-typing rounded numbers — the CFA answer choices are often only a few basis points apart.



2

Time Value of Money

The TVM worksheet: present value, future value, payments, rates and periods — plus discrete, continuous and effective-rate conversions

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [The TVM Worksheet — Solving for PV and FV](#)
- [Solving for Payment \(PMT\), Rate \(I/Y\) and Periods \(N\)](#)
- [Annuity Due, Perpetuities & Deferred Cash Flows](#)
- [Discrete Compounding — Effect of Compounding Frequency](#)
- [Continuous Compounding — \$e^x\$ and \$\ln\$](#)
- [Interest Converter \(ICONV\) — Nominal \$\rightleftharpoons\$ Effective Rates](#)

The TVM Worksheet — Solving for PV and FV

FORMULA

$$PV = FV \div (1 + r)^N$$
$$PV \text{ of annuity} = PMT \times (1 - (1 + r)^{-N}) \div r$$

Enter any four of **N, I/Y, PV, PMT, FV** → **[CPT]** the fifth

NUMERICAL EXAMPLE

PV of a lump sum: ₹10,000 in 5 years @ 8%

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
5 [N]	N = 5
8 [I/Y]	I/Y = 8
10000 [FV]	FV = 10,000
0 [PMT]	PMT = 0
[CPT] [PV]	PV = -6,805.83

NUMERICAL EXAMPLE

FV of ₹2,000 at the end of each year, 10 yrs @ 7%

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
10 [N]	N = 10
7 [I/Y]	I/Y = 7
2000 [+/-] [PMT]	PMT = -2,000
0 [PV]	PV = 0
[CPT] [FV]	FV = 27,632.90

KEY-WORD CLUSTER

Reading the TVM keys

- ✦ **N** = number of periods; **I/Y** = rate per period in percent (type 8, not 0.08); **PMT** = level payment each period.
- ✦ PV comes out negative because it is the cash you pay today to receive the positive FV — just ignore the sign when reporting.
- ✦ Lump sum FV check: 5,000 today @ 6% for 10 years → 10 **[N]** 6 **[I/Y]** 5000 **[+/-]** **[PV]** 0 **[PMT]** **[CPT]** **[FV]** = 8,954.24.

Solving for Payment (PMT), Rate (I/Y) and Periods (N)

PMT

Home loan EMI

₹5,00,000 loan, 9% p.a., monthly payments for 20 years

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
240 [N]	N = 240
9 [÷] 12 [=] [I/Y]	I/Y = 0.75
500000 [PV]	PV = 5,00,000
0 [FV]	FV = 0
[CPT] [PMT]	PMT = -4,498.63

I/Y

Implied return

Pay ₹800 today, receive ₹1,200 in 6 years. What annual return?

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
6 [N]	N = 6
800 [+/-] [PV]	PV = -800
0 [PMT]	PMT = 0
1200 [FV]	FV = 1,200
[CPT] [I/Y]	I/Y = 6.99%

N

Doubling time

How many years for money to double at 9% p.a.?

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
9 [I/Y]	I/Y = 9
1 [+/-] [PV]	PV = -1
0 [PMT]	PMT = 0
2 [FV]	FV = 2
[CPT] [N]	N = 8.04 years

KEY-WORD CLUSTER

Non-annual periods & error messages

- Monthly / quarterly / semi-annual: $N = \text{years} \times m$ and $I/Y = \text{annual rate} \div m$. A computed I/Y is a **periodic** rate — multiply by m to report the stated annual rate.
- Error 5** when computing I/Y or N means PV and FV have the same sign — one of them must be entered as negative.
- Rule of 72 sanity check: $72 \div 9 \approx 8$ years, close to the exact 8.04.

Annuity Due, Perpetuities & Deferred Cash Flows

FORMULA

$$PV(\text{annuity due}) = PV(\text{ordinary annuity}) \times (1 + r)$$

NUMERICAL EXAMPLE

₹1,000 at the **START** of each year, 5 yrs @ 10%

Keystrokes	Display / Result
[2ND] [BGN] [2ND] [SET] [2ND] [QUIT]	"BGN" on screen
[2ND] [CLR TVM]	0
5 [N] 10 [I/Y]	N = 5, I/Y = 10
1000 [+/-] [PMT] 0 [FV]	PMT = -1,000
[CPT] [PV]	PV = 4,169.87

EXAM TIP Check: END-mode PV = $3,790.79 \times 1.10 = 4,169.87$. Switch back to END immediately afterwards!

FORMULA

$$\text{Perpetuity: } PV = PMT \div r \quad \text{Growing: } PV = C_1 \div (r - g)$$

NUMERICAL EXAMPLE

Preferred share & deferred perpetuity

Problem	Keystrokes	Result
₹5 dividend forever, $r = 8\%$	5 [÷] 0.08 [=]	62.50
Same ₹5 but first payment at $t = 4$ (value at $t = 3$, then discount 3 years)	5 [÷] 0.08 [=] [÷] 1.08 [y ^x] 3 [=]	49.61
₹5 next year growing 3%, $r = 8\%$	5 [÷] [(1 0.08 [-] 0.03 D)] [=]	100.00

EXAM TIP A perpetuity valued with $PMT \div r$ lands one period BEFORE the first payment — discount from there.

Discrete Compounding — Effect of Compounding Frequency

FORMULA

$$FV = PV \times (1 + r_s \div m)^{(m \times N)}$$

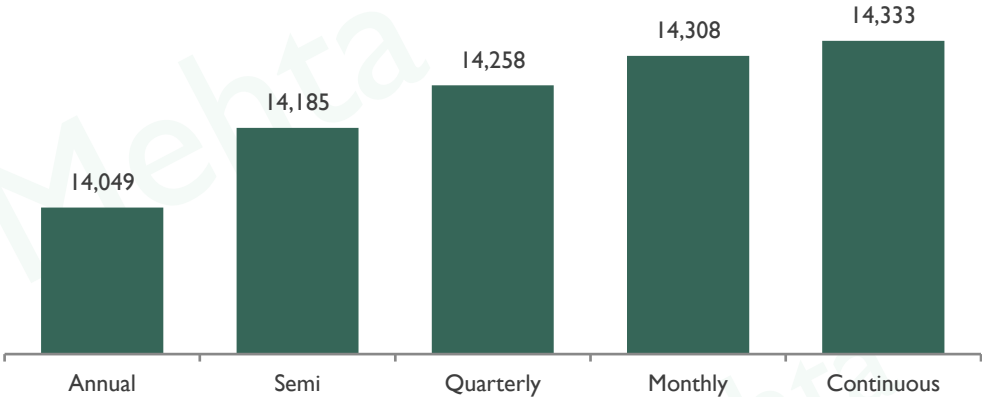
$$EAR = (1 + r_s \div m)^m - 1$$

NUMERICAL EXAMPLE

₹10,000 for 3 years at a stated 12% p.a.

FV of ₹10,000 after 3 years @ 12% stated

Keystrokes				Display / Result	
Monthly: 36 [N] 1 [I/Y] 10000 [+/-] [PV] 0 [PMT] [CPT] [FV]				FV = 14,307.69	
Frequency	m	N	I/Y	FV (₹)	EAR
Annual	1	3	12	14,049.28	12.0000%
Semi-annual	2	6	6	14,185.19	12.3600%
Quarterly	4	12	3	14,257.61	12.5509%
Monthly	12	36	1	14,307.69	12.6825%
Continuous	∞	—	—	14,333.29	12.7497%



EXAM TIP Alternative: set [2ND] [P/Y] 12 (C/Y follows) and key N = 36, I/Y = 12 directly. Safer habit: keep P/Y = 1 and convert N and I/Y yourself.

Continuous Compounding — e^x and LN

FORMULA

$$FV = PV \times e^{(r \cdot t)} \quad PV = FV \times e^{(-r \cdot t)} \quad r_{cc} = \ln(1 + HPR) = \ln(S_1 \div S_0) \quad EAR = e^r - 1$$

NUMERICAL EXAMPLE

Five calculations you will meet in Quants, Portfolio Management and Derivatives

Problem	Keystrokes	Display	Answer
FV of ₹10,000 @ 12% cc for 3 years	0.12 [*] 3 [=] [2ND] [e^x] [*] 10000 [=]	14,333.29	₹14,333.29
PV of ₹10,000 due in 4 years @ 8% cc	0.08 [*] 4 [=] [+/-] [2ND] [e^x] [*] 10000 [=]	7,261.49	₹7,261.49
Continuously compounded return, price 50 → 56	56 [÷] 50 [=] [LN]	0.113329	11.33%
Effective annual rate of 12% cc	0.12 [2ND] [e^x] [-] 1 [=]	0.127497	12.75%
cc rate equivalent to an EAR of 10%	1.10 [LN]	0.095310	9.53%

KEY-WORD CLUSTER

Why continuous compounding matters

- ✦ Continuously compounded returns are **additive over time**: $r(0,T) = r_1 + r_2 + \dots + r_T$, so a multi-period HPR = $e^{(\sum r)} - 1$.
- ✦ They underpin the lognormal price model (Quants) and continuous-time forward pricing, $F_0 = S_0 \times e^{(r \cdot T)}$ (Derivatives).
- ✦ The ICONV worksheet cannot handle continuous compounding — always use [2ND] [e^x] and [LN].

Interest Converter (ICONV) — Nominal ⇌ Effective Rates

FORMULA

$$EFF = (1 + NOM \div C/Y)^{(C/Y)} - 1$$

$$NOM = C/Y \times ((1 + EFF)^{(1 \div C/Y)} - 1)$$

NOM → EFF

12% compounded monthly

Keystrokes	Display / Result
[2ND] [ICONV]	NOM = ...
12 [ENTER]	NOM = 12
[↓] [↓] 12 [ENTER]	C/Y = 12
[↑] [CPT]	EFF = 12.6825%

EFF → NOM

EAR 10.25%, semi-annual compounding

Keystrokes	Display / Result
[2ND] [ICONV] [↓]	EFF = ...
10.25 [ENTER]	EFF = 10.25
[↓] 2 [ENTER]	C/Y = 2
[↑] [↑] [CPT]	NOM = 10.0000%

NUMERICAL EXAMPLE

Two-step conversion between frequencies

Task	Step 1	Step 2	Answer
8% compounded semi-annually → equivalent quarterly stated rate	NOM 8, C/Y 2 → [CPT] EFF = 8.16	Keep EFF, set C/Y 4 → [CPT] NOM	7.9216%
Bond-equivalent yield 6.0086% → effective annual yield	NOM 6.0086, C/Y 2	[CPT] EFF	6.0989%

EXAM TIP In ICONV only C/Y matters — P/Y is ignored. Leave the worksheet with [2ND] [QUIT].

3

Cash Flow Worksheet — NPV & IRR

Uneven cash flows for capital budgeting, portfolio returns and equity valuation using [CF], [NPV] and [IRR]

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [NPV & IRR with the CF Worksheet](#)
- [Grouped Cash Flows \(Fnn\), Money-Weighted & Time-Weighted Returns](#)

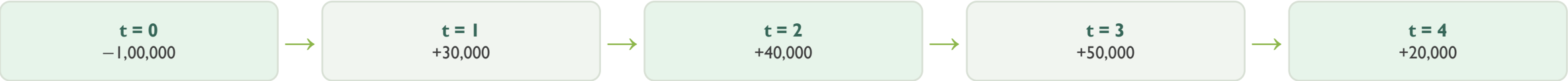
NPV & IRR with the CF Worksheet

FORMULA

$$NPV = \sum CF_t \div (1 + r)^t$$

$$IRR = \text{the discount rate at which } NPV = 0$$

$$PI = PV \text{ of inflows} \div \text{initial outlay} = 1 + NPV \div |CF_0|$$



NUMERICAL EXAMPLE

Project cash flows, cost of capital 10%

Keystrokes	Display	What it means
[CF] [2ND] [CLR WORK]	CF0 = 0	Open & clear the worksheet
100000 [+/-] [ENTER]	CF0 = −100,000	Initial outlay
[↓] 30000 [ENTER] [↓]	C01 = 30,000 · F01 = 1	[↓] past F01 accepts frequency 1
[↓] 40000 [ENTER] [↓]	C02 = 40,000	
[↓] 50000 [ENTER] [↓]	C03 = 50,000	
[↓] 20000 [ENTER]	C04 = 20,000	
[NPV] 10 [ENTER] [↓] [CPT]	NPV = 11,556.59	I = 10 (percent)
[IRR] [CPT]	IRR = 15.32	15.32% > 10% → accept

KEY-WORD CLUSTER

Decision rules

- ✦ **NPV > 0** → accept; the project adds value.
- ✦ **IRR > cost of capital** → accept.
- ✦ **PI = 1 + 11,556.59 ÷ 1,00,000 = 1.1156 > 1** → accept.
- ✦ Mutually exclusive projects that conflict: choose the **higher NPV**.
- ✦ Payback = 2 + 30,000 ÷ 50,000 = **2.6 years**; discounted payback ≈ **3.15 years**.

Grouped Cash Flows (Fnn), Money-Weighted & Time-Weighted Returns

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NUMERICAL EXAMPLE

Repeating cash flows with frequencies

$CF_0 = -50,000$; ₹8,000 each year for years 1–5; ₹20,000 in year 6; $r = 8\%$

Keystrokes	Display / Result
[CF] [2ND] [CLR WORK]	$CF0 = 0$
50000 [+/-] [ENTER]	$CF0 = -50,000$
[↓] 8000 [ENTER]	$C01 = 8,000$
[↓] 5 [ENTER]	$F01 = 5$
[↓] 20000 [ENTER] [↓]	$C02 = 20,000, F02 = 1$
[NPV] 8 [ENTER] [↓] [CPT]	NPV = -5,454.93
[IRR] [CPT]	IRR = 4.76%

EXAM TIP Fnn = how many times in a row Cnn repeats (max 99). Saves keystrokes and errors.

NUMERICAL EXAMPLE

Money-weighted return (MWRR) = IRR

Buy 1 share @ 100 (t0); buy 1 more @ 120 (t1); ₹2 dividend per share each year; sell both @ 130 (t2)

Time	Investor cash flow	CF entry
t = 0	-100	$CF0 = -100$
t = 1	$-120 + 2 = -118$	$C01 = -118$
t = 2	$2 \times (130 + 2) = +264$	$C02 = 264$

Keystrokes	Display / Result
[IRR] [CPT]	MWRR = 13.86%

FORMULA

Time-weighted return (TWRR)

$HPR_1 = (120 + 2 - 100) \div 100 = 22\%$ $HPR_2 = (130 + 2 - 120) \div 120 = 10\%$

Keystrokes	Display / Result
1.22 [*] 1.10 [=] [$\sqrt{x}$] [-] 1 [=]	TWRR = 15.84%



4

Statistics & Probability

The DATA and STAT worksheets for mean, variance, standard deviation, covariance, correlation and regression — plus means, counting and the binomial

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [One-Variable Statistics — Mean, Variance & Standard Deviation](#)
- [Probability-Weighted Expected Return & Standard Deviation](#)
- [Two-Variable Statistics — Covariance, Correlation & Regression](#)
- [Geometric & Harmonic Means, Counting Rules and the Binomial](#)

One-Variable Statistics — Mean, Variance & Standard Deviation

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NUMERICAL EXAMPLE

Annual returns (%): 12, −5, 8, 15, 3

Keystrokes	Display	What it means
[2ND] [DATA] [2ND] [CLR WORK]	X01 = 0	Open & clear the data table
12 [ENTER] [↓] [↓]	X01 = 12	Skip Y01 (frequency stays 1)
5 [+/-] [ENTER] [↓] [↓]	X02 = −5	
8 [ENTER] [↓] [↓] 15 [ENTER] [↓] [↓] 3 [ENTER]	X03 ... X05	
[2ND] [STAT] [2ND] [SET] until I-V	I-V	One-variable mode
[↓]	n = 5	
[↓]	$\bar{x} = 6.60$	Mean return 6.60%
[↓]	Sx = 7.8930	SAMPLE standard deviation
[↓]	$\sigma_x = 7.0597$	POPULATION standard deviation
At Sx press [x²]	62.30	Sample variance (%)²

FORMULA

$$s^2 = \Sigma(X_i - \bar{X})^2 \div (n - 1)$$
$$\sigma^2 = \Sigma(X_i - \mu)^2 \div N$$

KEY-WORD CLUSTER

- ◆ Use **Sx** for a sample (CFA default), **σ_x** for a population.
- ◆ Coefficient of variation = $S_x \div \bar{x} = 7.8930 \div 6.60 = 1.196$.
- ◆ 95% CI for the mean: $6.60 \pm 1.96 \times 7.893 \div \sqrt{5} = 6.60 \pm 6.92$.
- ◆ The data table keeps its values until you clear it — always **[2ND] [CLR WORK]** first.

Probability-Weighted Expected Return & Standard Deviation

FORMULA

$$E(R) = \sum p_i \times R_i$$

$$\sigma^2 = \sum p_i \times (R_i - E(R))^2$$

NUMERICAL EXAMPLE

Economic scenarios

Scenario	Probability	Return	Enter as
Boom	30%	20%	X01 = 20, Y01 = 30
Normal	50%	10%	X02 = 10, Y02 = 50
Recession	20%	−5%	X03 = −5, Y03 = 20

EXAM TIP The trick: in I-V mode, Y is a FREQUENCY. Enter each probability × 100 as Y so the frequencies total 100.

MANUAL CHECK

- ✦ $E(R) = 0.3 \times 20 + 0.5 \times 10 + 0.2 \times (-5) = 10\%$
- ✦ $\sigma^2 = 0.3 \times 10^2 + 0.5 \times 0^2 + 0.2 \times 15^2 = 75; \sigma = 8.66\%$

KEYSTROKES

DATA with frequencies

Keystrokes	Display / Result
[2ND] [DATA] [2ND] [CLR WORK]	X01
20 [ENTER] [↓] 30 [ENTER] [↓]	X01 = 20, Y01 = 30
10 [ENTER] [↓] 50 [ENTER] [↓]	X02 = 10, Y02 = 50
5 [+/-] [ENTER] [↓] 20 [ENTER]	X03 = −5, Y03 = 20
[2ND] [STAT] (I-V) [↓]	n = 100
[↓]	$\bar{x} = 10.00 = E(R)$
[↓] [↓]	$\sigma x = 8.66 = \sigma$
[x²]	75.00 = variance

EXAM TIP Use σx (population), not Sx , for a probability distribution.

Two-Variable Statistics — Covariance, Correlation & Regression

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NUMERICAL EXAMPLE

Monthly returns (%): Market X = 5, −2, 8, 3, −4, 6; Stock Y = 7, −4, 11, 2, −6, 9

Keystrokes	Display	What it means
[2ND] [DATA] [2ND] [CLR WORK]	X01	
5 [ENTER] [↓] 7 [ENTER] [↓]	X01 = 5, Y01 = 7	Enter X then Y
2 [+/-] [ENTER] [↓] 4 [+/-] [ENTER] [↓] ... for all 6 pairs	X06 = 6, Y06 = 9	
[2ND] [STAT] [2ND] [SET] until LIN	LIN	Linear regression mode
[↓] [↓] [↓]	n = 6 · $\bar{x}$ = 2.6667 · Sx = 4.7188	Scroll down
[↓] [↓] [↓]	$\bar{y}$ = 3.1667 · Sy = 7.0261	(σx, σy skipped)
[↓] to a	a = −0.7695	Intercept
[↓]	b = 1.4760	Slope (= beta)
[↓]	r = 0.9913	Correlation
[↓] X' = 4 [ENTER] [↓] Y' [CPT]	Y' = 5.1347	Forecast Y when X = 4%

FORMULA

$$\text{Cov}(X,Y) = r \times S_x \times S_y$$
$$R^2 = r^2 \qquad b = \text{Cov} \div S_x^2$$
$$\hat{Y} = a + b \times X$$

KEYSTROKES

Covariance from the STAT worksheet

Keystrokes	Display / Result
At r: [STO] 1	M1 = 0.9913
At Sx: [STO] 2	M2 = 4.7188
At Sy: [STO] 3	M3 = 7.0261
[2ND] [QUIT] [RCL] 1 [*] [RCL] 2 [*] [RCL] 3 [=]	Cov = 32.8667
[RCL] 1 [x²]	R² = 0.9827

Geometric & Harmonic Means, Counting Rules and the Binomial

KEY FORMULAS

Everything solved in one line on the calculator (AOS mode)

Measure	Formula	Keystrokes	Result
Geometric mean return (10%, -20%, 15%)	$((1+R_1)(1+R_2)(1+R_3))^{1/3} - 1$	1.10 [×] 0.80 [×] 1.15 [=] [y ^x] 3 [1/x] [=] [-] 1 [=]	0.40%
Arithmetic mean (same returns)	$\Sigma R \div n$	10 [+] 20 [+/-] [+] 15 [=] [÷] 3 [=]	1.67%
Harmonic mean (cost averaging: ₹20, ₹25, ₹40)	$n \div \Sigma(1 \div X_i)$	20 [1/x] [+] 25 [1/x] [+] 40 [1/x] [=] [1/x] [×] 3 [=]	₹26.09
Factorial	$n!$	5 [2ND] [x!]	120
Combinations (choose 3 of 10)	$n! \div ((n - r)! r!)$	10 [2ND] [nCr] 3 [=]	120
Permutations (order 3 of 10)	$n! \div (n - r)!$	10 [2ND] [nPr] 3 [=]	720
Binomial: $P(X = 3)$, $n = 5$, $p = 0.4$	${}_nC_x p^x (1 - p)^{n-x}$	5 [2ND] [nCr] 3 [=] [×] 0.4 [y ^x] 3 [×] 0.6 [x ²] [=]	0.2304
Binomial mean & variance	np ; $np(1 - p)$	5 [×] 0.4 [=] ; [×] 0.6 [=]	2.0 ; 1.2

EXAM TIP Arithmetic mean $\geq$ geometric mean $\geq$ harmonic mean (1.67% > 0.40% here). Use the geometric mean for multi-period compound growth.

5

Fixed Income

Bond prices, yields, spot and forward rates, amortization schedules, duration, convexity and money-market yields

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Bond Valuation — Price from Yield-to-Maturity](#)
- [Yield-to-Maturity & Yield Conventions](#)
- [Pricing Between Coupon Dates — Full Price, Accrued Interest & Flat Price](#)
- [Pricing with Spot Rates & Implied Forward Rates](#)
- [Amortizing Bonds & Loans — the AMORT Worksheet](#)
- [Duration & Convexity — Approximation with the TVM Worksheet](#)
- [Money-Market Yields — Discount Rate, Add-On Rate & Periodicity](#)

Bond Valuation — Price from Yield-to-Maturity

FORMULA

$$PV = PMT \div (1 + r)^1 + PMT \div (1 + r)^2 + \dots + (PMT + FV) \div (1 + r)^N$$

NUMERICAL EXAMPLE

5-yr, 6% semi-annual coupon, par 1,000, YTM 7%

Keystrokes	Display	What it means
[2ND] [CLR TVM]	0	
10 [N]	N = 10	5 years × 2
7 [÷] 2 [=] [I/Y]	I/Y = 3.5	YTM ÷ 2
30 [PMT]	PMT = 30	60 ÷ 2
1000 [FV]	FV = 1,000	
[CPT] [PV]	PV = -958.42	Discount bond

KEY-WORD CLUSTER

Price–yield relationship (same bond)

YTM	I/Y	Price	Trades at
5%	2.5	1,043.76	Premium
6%	3.0	1,000.00	Par
7%	3.5	958.42	Discount

- ◆ Coupon > YTM → premium; coupon = YTM → par; coupon < YTM → discount.
- ◆ Change only I/Y and press [CPT] [PV] again — N, PMT and FV stay stored.

EXAM TIP Semi-annual bonds: N = years × 2, I/Y = YTM ÷ 2, PMT = annual coupon ÷ 2. Quarterly: × 4 and ÷ 4.

Yield-to-Maturity & Yield Conventions

[◀ Back to Index](#)

NUMERICAL EXAMPLE

YTM: 10-yr, 5% annual coupon, price 92.50

Keystrokes	Display / Result
[2ND] [CLR TVM]	0
10 [N] 5 [PMT] 100 [FV]	inputs
92.5 [+/-] [PV]	PV = -92.50
[CPT] [I/Y]	YTM = 6.02%

NUMERICAL EXAMPLE

Same bond paying semi-annually

Keystrokes	Display / Result
20 [N] 2.5 [PMT] 100 [FV] 92.5 [+/-] [PV]	inputs
[CPT] [I/Y]	3.0043 (per half-year)
[×] 2 [=]	YTM = 6.0086% (BEY)

KEY-WORD CLUSTER

Other yield measures

Measure	Keystrokes	Result
Current yield = coupon ÷ price	5 [÷] 92.5 [=]	5.41%
Zero-coupon YTM (5-yr, price 78.35)	5 [N] 78.35 [+/-] [PV] 100 [FV] 0 [PMT] [CPT] [I/Y]	5.00%
Effective annual yield from 6.0086% semi-annual	[2ND] [ICONV] NOM 6.0086, C/Y 2, [CPT] EFF	6.0989%

EXAM TIP The quoted YTM on a semi-annual bond is the periodic yield × 2 (semi-annual bond basis). Compare bonds only on the SAME periodicity.

Pricing Between Coupon Dates — Full Price, Accrued Interest & Flat Price

FORMULA

$$PV_Full = PV \text{ (at last coupon date)} \times (1 + r)^{(t \div T)} \qquad AI = (t \div T) \times PMT \qquad PV_Flat = PV_Full - AI$$

NUMERICAL EXAMPLE

6% semi-annual bond, 3 years (6 periods) left from last coupon, YTM 5%, 60 of 180 days elapsed (30/360)

Keystrokes	Display	What it means
[2ND] [CLR TVM] 6 [N] 2.5 [I/Y] 3 [PMT] 100 [FV] [CPT] [PV]	PV = −102.7541	Value at the last coupon date
[+/-] [×] 1.025 [y ^x] [(] 60 [÷] 180 [)] [=]	103.6033	Full (dirty / invoice) price
3 [×] 60 [÷] 180 [=]	1.0000	Accrued interest
103.6033 [-] 1 [=]	102.6033	Flat (clean / quoted) price

KEY-WORD CLUSTER

Conventions

- ✦ Buyer pays the **full price**; dealers quote the **flat price**.
- ✦ Day count: actual/actual (government bonds); 30/360 (corporate bonds).

ALTERNATIVE

The **BOND** worksheet

- ✦ **[2ND] [BOND]**: enter SDT (settlement date), CPN, RDT (maturity), RV = 100, day count (ACT or 360), 2/Y, YLD; then **[↓]** to PRI and **[CPT]** — AI is shown next.

Pricing with Spot Rates & Implied Forward Rates

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FORMULA

$$PV = PMT \div (1 + z_1) + PMT \div (1 + z_2)^2 + (PMT + FV) \div (1 + z_3)^3 \qquad (1 + z_2)^2 = (1 + z_1)(1 + {}^1y_2y)$$

NUMERICAL EXAMPLE

3-yr 5% annual bond; spot rates 3%, 4%, 5%

Keystrokes (AOS mode)	Display
5 [÷] 1.03 [+] 5 [÷] 1.04 [x²] [+] 105 [÷] 1.05 [yˣ] 3 [=]	Price = 100.1801
Memory route (works in Chain mode too)	Display
5 [÷] 1.03 [=] [STO] 1	4.8544
5 [÷] 1.04 [x²] [=] [STO] [+] 1	+ 4.6228
1.05 [yˣ] 3 [=] [1/x] [×] 105 [=] [STO] [+] 1	+ 90.7029
[RCL] 1	100.1801
Implied YTM	Display
3 [N] 5 [PMT] 100 [FV] 100.1801 [+/-] [PV] [CPT] [I/Y]	YTM = 4.93%

NUMERICAL EXAMPLE

Implied forward rates from the same curve

Forward	Keystrokes	Result
1y1y	1.04 [x²] [÷] 1.03 [-] 1 [=]	5.01%
2y1y	1.05 [yˣ] 3 [÷] 1.04 [x²] [-] 1 [=]	7.03%
1y2y (annualised)	1.05 [yˣ] 3 [÷] 1.03 [=] [√x] [-] 1 [=]	6.01%

EXAM TIP A bond priced off the spot curve has ONE yield (4.93%) — a weighted blend of the spot rates, closest to the longest one because most cash comes at maturity.

Amortizing Bonds & Loans — the AMORT Worksheet

NUMERICAL EXAMPLE

₹1,00,000 fully amortizing bond / loan, 8% p.a., 5 equal annual payments

Keystrokes	Display	What it means
[2ND] [CLR TVM] 5 [N] 8 [I/Y] 100000 [PV] 0 [FV]		Step 1: load TVM
[CPT] [PMT]	PMT = -25,045.65	Level annual payment
[2ND] [AMORT] 1 [ENTER] [↓] 1 [ENTER]	PI = 1, P2 = 1	Step 2: year 1 only
[↓]	BAL = 82,954.35	Balance after year 1
[↓]	PRN = -17,045.65	Principal repaid
[↓]	INT = -8,000.00	Interest paid
[↓] (to P1) [CPT]	PI = 2, P2 = 2	Jumps to the next year
PI = 1, P2 = 3	INT = -19,799.95	Cumulative interest, years 1-3

Year	Interest	Principal	Balance
1	8,000.00	17,045.65	82,954.35
2	6,636.35	18,409.30	64,545.06
3	5,163.60	19,882.04	44,663.02
4	3,573.04	21,472.60	23,190.41
5	1,855.23	23,190.41	0.00

EXAM TIP Monthly mortgage: $N = 360$, $I/Y = \text{rate} \div 12$, then $PI = 1$, $P2 = 12$ gives year-1 totals; $PI = 13$, $P2 = 24$ gives year 2.

◆ Each payment is identical; the interest share falls and the principal share rises every year.

Duration & Convexity — Approximation with the TVM Worksheet

FORMULA

$$\text{ApproxModDur} = (PV_- - PV_+) \div (2 \times \Delta Y \times PV_0) \quad \text{ApproxCon} = (PV_- + PV_+ - 2PV_0) \div ((\Delta Y)^2 \times PV_0)$$

$$\% \Delta PV \approx -\text{ModDur} \times \Delta Y + \frac{1}{2} \times \text{Con} \times (\Delta Y)^2$$

NUMERICAL EXAMPLE

5-yr 6% semi-annual bond, YTM 7%, $\Delta Y = 10$ bp

Keystrokes	Display / Result
Price at 7%: 10 [N] 3.5 [I/Y] 30 [PMT] 1000 [FV] [CPT] [PV] [+/-] [STO] 0	$PV_0 = 958.4170$
7.1 [÷] 2 [=] [I/Y] [CPT] [PV] [+/-] [STO] 1	$PV_+ = 954.3737$
6.9 [÷] 2 [=] [I/Y] [CPT] [PV] [+/-] [STO] 2	$PV_- = 962.4808$
[([RCL] 2 [-] [RCL] 1 [÷]) ([1] 2 [×] 0.001 [×] [RCL] 0 [÷]) [=]	ModDur = 4.2294
[([RCL] 2 [+] [RCL] 1 [-] 2 [×] [RCL] 0 [÷]) ([1] 0.001 [× ²] [×] [RCL] 0 [÷]) [=]	Convexity = 21.46

KEY-WORD CLUSTER

Using the results

- ✦ Macaulay $\approx \text{ModDur} \times (1 + r \div 2) = 4.2294 \times 1.035 = 4.38$ years.
- ✦ +100 bp shock: $-4.2294 \times 0.01 + \frac{1}{2} \times 21.46 \times 0.0001 = -4.12\%$.
- ✦ PVBP $\approx (PV_- - PV_+) \div 2 \div 10 = ₹0.405$ per 1 bp.
- ✦ Money duration = $\text{ModDur} \times PV_{\text{full}} = 4.2294 \times 958.42 \approx ₹4,053.5$.

EXAM TIP Convexity is extremely sensitive to rounding — keep PVs in memory (M0–M2) rather than typing 4-decimal values.

Money-Market Yields — Discount Rate, Add-On Rate & Periodicity

FORMULA

Discount basis: $PV = FV \times (1 - \text{Days} \div \text{Year} \times DR)$ Add-on basis: $AOR = (\text{Year} \div \text{Days}) \times (FV - PV) \div PV$

NUMERICAL EXAMPLE

180-day T-bill quoted at a 5% discount rate (360-day year), $FV = 100$

Keystrokes	Display	What it means
180 [÷] 360 [×] 0.05 [=] [+/-] [+] [=] [×] 100 [=]	97.50	Price of the T-bill
100 [÷] 97.5 [-] [=]	0.025641	Holding-period return (2.5641%)
[×] 365 [÷] 180 [=]	0.051994	Add-on yield, 365-day basis = 5.20%
1.025641 [y ^x] [(⁾ 365 [÷] 180 ()] [=] [-] [=]	0.052680	Effective annual (compounded) = 5.27%

KEY-WORD CLUSTER

Why the three numbers differ

- ✦ The discount rate is based on FACE value (not price) and a 360-day year — it always understates the true return.
- ✦ The add-on rate uses the PRICE paid; the effective annual rate additionally assumes compounding, so $EAR > AOR > DR$.

6

Equity

Dividend discount models, multi-stage valuation with the CF worksheet, implied returns, multiples and margin transactions

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Dividend Discount Models — Gordon Growth, Preferred & Multiples](#)
- [Multi-Stage DDM with the CF Worksheet](#)
- [Margin Transactions, Leverage & Holding-Period Returns](#)

Dividend Discount Models — Gordon Growth, Preferred & Multiples

FORMULA

$V_0 = D_1 \div (r - g) = D_0(1 + g) \div (r - g)$ $V_{pref} = D \div r$ $r = D_1 \div P_0 + g$ $g = b \times ROE$ $P_0 \div E_1 = (1 - b) \div (r - g)$

NUMERICAL EXAMPLE

Five equity valuation calculations

Problem	Keystrokes	Result
Gordon growth: $D_0 = 2.00$, $g = 5\%$, $r = 10\%$	2 [*] 1.05 [=] [÷] [(] 0.10 [-] 0.05 [)] [=]	₹42.00
Preferred stock: ₹5 dividend, $r = 8\%$	5 [÷] 0.08 [=]	₹62.50
Implied required return: $P_0 = 40$, $D_1 = 1.60$, $g = 6\%$	1.6 [÷] 40 [+] 0.06 [=]	10.00%
Sustainable growth: ROE 15%, payout 40%	0.15 [*] [(] 1 [-] 0.4 [)] [=]	9.00%
Justified forward P/E: payout 40%, $r = 12\%$, $g = 9\%$	0.4 [÷] [(] 0.12 [-] 0.09 [)] [=]	13.33×

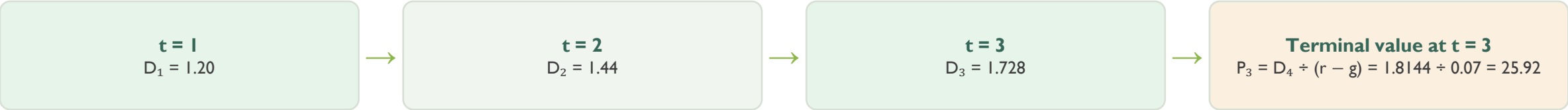
EXAM TIP The Gordon model needs NEXT year's dividend: multiply D_0 by $(1 + g)$ first. It only works when $r > g$.

Multi-Stage DDM with the CF Worksheet

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NUMERICAL EXAMPLE

$D_0 = ₹1.00$; dividends grow 20% for 3 years, then 5% forever; required return 12%



KEYSTROKES

Keystrokes	Display / Result
[CF] [2ND] [CLR WORK]	CF0 = 0
[↓] 1.2 [ENTER] [↓]	C01 = 1.20
[↓] 1.44 [ENTER] [↓]	C02 = 1.44
[↓] 27.648 [ENTER]	C03 = 1.728 + 25.92
[NPV] 12 [ENTER] [↓] [CPT]	$V_0 = ₹21.90$

KEY-WORD CLUSTER

Building the cash flows

- ◆ Terminal value: $1.728 \times 1.05 \div 0.07 \rightarrow 25.92$ (use D_4 , not D_3).
- ◆ Put the terminal value in the SAME period as the last explicit dividend: $CF_3 = D_3 + P_3 = 27.648$.
- ◆ $CF_0 = 0$ because nothing is paid today; the NPV is the intrinsic value.
- ◆ Same method works for FCFE / FCFF models with a terminal value.

Margin Transactions, Leverage & Holding-Period Returns

FORMULA

$\text{Leverage ratio} = 1 \div \text{IM}$ $\text{Margin-call price} = P_0 \times (1 - \text{IM}) \div (1 - \text{MM})$ $\text{Return on equity} = (\text{Gain} + \text{Dividends} - \text{Interest}) \div \text{Equity}$

NUMERICAL EXAMPLE

Buy 100 shares @ ₹40; initial margin 50%; maintenance margin 25%

Item	Keystrokes	Result
Equity invested	100 [*] 40 [*] 0.5 [=]	₹2,000
Leverage ratio	0.5 [1/x]	2.0×
Margin-call price	40 [*] [(1 [-] 0.5 D)] [÷] [(1 [-] 0.25 D)] [=]	₹26.67
Return on equity if price rises to ₹44	[(1 44 [-] 40 D)] [*] 100 [÷] 2000 [=]	20% (vs. 10% unlevered)
Stock HPR: $P_0 = 50$, $P_1 = 54$, dividend 1	54 [-] 50 [+] [=] [÷] 50 [=]	10%

EXAM TIP Leverage magnifies returns both ways: a 10% price fall would produce a −20% return on equity (before interest).

7

Portfolio Management

Return measures, two-asset portfolio risk, beta, CAPM and risk-adjusted performance ratios

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Return Measures — HPR, Annualised, Real & Portfolio Returns](#)
- [Two-Asset Portfolio Risk & Return](#)
- [Beta, CAPM & Risk-Adjusted Performance Measures](#)

Return Measures — HPR, Annualised, Real & Portfolio Returns

FORMULA

$$\text{HPR} = (P_1 - P_0 + D_1) \div P_0 \qquad R_{\text{annual}} = (1 + R_{\text{period}})^{(365 \div \text{days})} - 1 \qquad (1 + R_{\text{nominal}}) = (1 + R_{\text{real}})(1 + \pi)$$

NUMERICAL EXAMPLE

Return calculations tested every year

Problem	Keystrokes	Result
HPR: bought at 50, sold at 54, dividend 1	54 [-] 50 [+] [=] [÷] 50 [=]	10.00%
Annualise a 2% return earned over 45 days	1.02 [y ^x] [(] 365 [÷] 45 [)] [=] [-] [=]	17.42%
Real return: nominal 8%, inflation 3%	1.08 [÷] 1.03 [-] [=]	4.85%
Portfolio return: 60% @ 10%, 40% @ 6%	0.6 [×] 10 [+] 0.4 [×] 6 [=]	8.40%
Geometric mean return (10%, -20%, 15%)	1.1 [×] 0.8 [×] 1.15 [=] [y ^x] 3 [1/x] [=] [-] [=]	0.40%
Multi-period cc return: 3%, -1%, 2% (cc)	0.03 [+] 0.01 [+/-] [+] 0.02 [=] [2ND] [e ^x] [-] [=]	HPR 4.08%

EXAM TIP Money-weighted vs time-weighted returns use the CF worksheet — see Chapter 3.

Two-Asset Portfolio Risk & Return

FORMULA

$$\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2$$

$$\text{Cov}_{12} = \rho_{12}\sigma_1\sigma_2$$

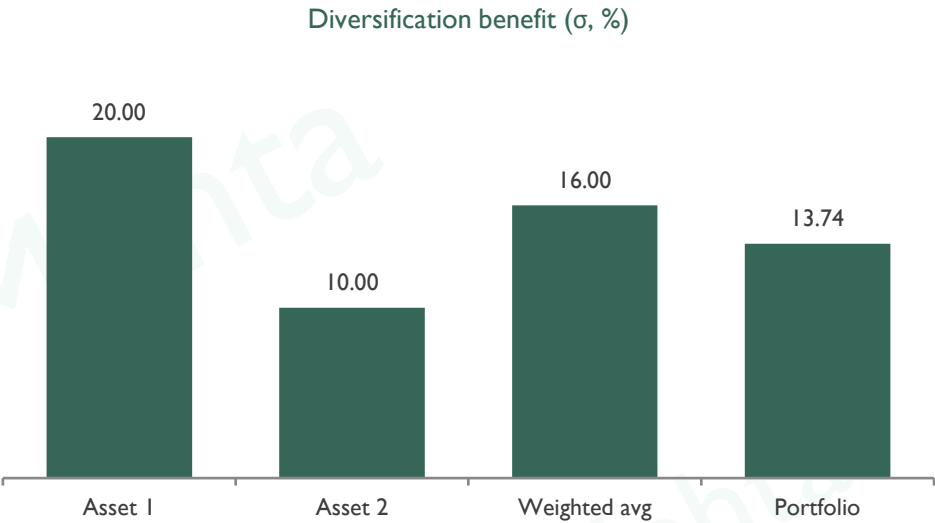
$$E(R_p) = w_1E(R_1) + w_2E(R_2)$$

NUMERICAL EXAMPLE

w = 60% / 40%; E(R) = 10% / 6%; σ = 20% / 10%; ρ = 0.3

Keystrokes	Display / Result
0.6 [x²] [x] 20 [x²] [+] 0.4 [x²] [x] 10 [x²] [+] 2 [x] 0.6 [x] 0.4 [x] 0.3 [x] 20 [x] 10 [=]	$\sigma_p^2 = 188.80 \text{ (\%}^2\text{)}$
[√x]	$\sigma_p = 13.74\%$
0.6 [x] 10 [+] 0.4 [x] 6 [=]	$E(R_p) = 8.40\%$
0.3 [x] 20 [x] 10 [=]	$\text{Cov} = 60 \text{ (\%}^2\text{)}$
8.4 [-] 3 [=] [÷] 13.74 [=]	$\text{Sharpe (Rf 3\%)} = 0.393$

EXAM TIP Work in percent throughout (20, not 0.20) — variance is then in %². Mixing units is the classic error.



Beta, CAPM & Risk-Adjusted Performance Measures

NUMERICAL EXAMPLE

Portfolio: $R_p = 12\%$, $\sigma_p = 15\%$, $\beta_p = 1.2$; Market: $R_m = 9\%$, $\sigma_m = 12\%$; $R_f = 3\%$

Measure	Formula	Keystrokes	Result
Beta ($\rho = 0.7$, $\sigma_i = 25\%$, $\sigma_m = 15\%$)	$\beta_i = \rho \sigma_i \div \sigma_m = \text{Cov} \div \sigma_m^2$	0.7 [×] 25 [÷] 15 [=]	1.1667
CAPM required return	$R_f + \beta(R_m - R_f)$	3 [+] 1.2 [×] [(] 9 [-] 3 [)] [=]	10.20%
Sharpe ratio	$(R_p - R_f) \div \sigma_p$	[(] 12 [-] 3 [)] [÷] 15 [=]	0.60
Treynor ratio	$(R_p - R_f) \div \beta_p$	[(] 12 [-] 3 [)] [÷] 1.2 [=]	7.50
Jensen's alpha	$R_p - \text{CAPM return}$	12 [-] 10.2 [=]	1.80%
M ² (M-squared)	$(R_p - R_f) \sigma_m \div \sigma_p - (R_m - R_f)$	9 [÷] 15 [×] 12 [-] 6 [=]	1.20%

KEY-WORD CLUSTER

Which risk measure?

Total risk (σ)

Sharpe ratio and M² — same ranking; use when the portfolio is the investor's whole wealth.

Systematic risk (β)

Treynor ratio and Jensen's alpha — use for a well-diversified portfolio that is part of a larger whole.

8

Corporate Issuers

Cost of debt, equity and preferred, WACC, capital budgeting shortcuts and the cost of trade credit

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Cost of Capital — Debt, Equity, Preferred & WACC](#)
- [Capital Budgeting Shortcuts & the Cost of Trade Credit](#)

Cost of Capital — Debt, Equity, Preferred & WACC

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FORMULA

$$WACC = w_d \times r_d \times (1 - t) + w_p \times r_p + w_e \times r_e \qquad r_e = R_f + \beta \times ERP \qquad r_p = D_p \div P_p$$

NUMERICAL EXAMPLE

Weights: debt 40%, equity 60%; tax rate 25%

Component	Keystrokes	Result
Pre-tax cost of debt: 10-yr 7% annual bond priced at 95	10 [N] 95 [+/-] [PV] 7 [PMT] 100 [FV] [CPT] [I/Y]	7.7363%
After-tax cost of debt	[×] 0.75 [=]	5.8023%
Cost of equity (CAPM): Rf 4%, β 1.1, ERP 6%	4 [+] 1.1 [×] 6 [=]	10.60%
Cost of preferred: ₹6 dividend, price ₹75	6 [÷] 75 [=]	8.00%
Bond-yield-plus-risk-premium (3%)	7.7363 [+] 3 [=]	10.74%
WACC	0.4 [×] 7.7363 [×] 0.75 [+] 0.6 [×] 10.6 [=]	8.68%

Cost of debt = YTM

Use the market YTM on existing debt, not the coupon rate. Solve it with TVM [CPT] [I/Y] and multiply by (1 – t).

Weights

Use target (or market-value) weights, not book values.

EXAM TIP Keep r_d in memory: [STO] 1 after [CPT] [I/Y], then use [RCL] 1 in the WACC line.

Capital Budgeting Shortcuts & the Cost of Trade Credit

FORMULA

Cost of trade credit = $(1 + \text{Discount} \div (1 - \text{Discount}))^{(365 \div \text{days beyond discount period})} - 1$

NUMERICAL EXAMPLE

Terms “2/10, net 30” — forgo the discount?

Keystrokes	Display / Result
2 [÷] 98 [+] 1 [=]	1.020408
[y ^x] [(1) 365 [÷] 20 (1)] [=]	1.445853
[-] 1 [=]	44.59%

EXAM TIP Days beyond discount = 30 – 10 = 20. If you can borrow below 44.59%, take the discount.

NUMERICAL EXAMPLE

Discounted payback for the Chapter 3 project (r = 10%)

Year	CF	PV (CF [÷] 1.1 [y ^x] t)	Cumulative
1	30,000	27,272.73	–72,727.27
2	40,000	33,057.85	–39,669.42
3	50,000	37,565.74	–2,103.68
4	20,000	13,660.27	+11,556.59

Keystrokes	Display / Result
3 [+] 2103.68 [÷] 13660.27 [=]	3.15 years

9

Financial Statement Analysis

The DEPR worksheet, effective-interest bond accounting, lease liabilities and growth rates

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Depreciation — the DEPR Worksheet \(SL, DDB, SYD\)](#)
- [Bonds Issued at a Discount — Effective Interest Method](#)
- [Lease Liabilities, Growth Rates & Present Values in FSA](#)

Depreciation — the DEPR Worksheet (SL, DDB, SYD)

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NUMERICAL EXAMPLE

Cost ₹50,000; salvage ₹5,000; useful life 5 years

Keystrokes	Display	What it means
[2ND] [DEPR] [2ND] [CLR WORK]	SL	Method shown first
[2ND] [SET] (repeat)	SL → SYD → DB ...	Choose the method
[↓] 5 [ENTER]	LIF = 5	Useful life
[↓] 1 [ENTER]	M01 = 1	Start month 1 = full first year
[↓] 200 [ENTER]	DB = 200	DB method only (200 = double)
[↓] 50000 [ENTER]	CST = 50,000	Cost
[↓] 5000 [ENTER]	SAL = 5,000	Salvage value
[↓] 1 [ENTER]	YR = 1	Year to compute
[↓] [↓] [↓]	DEP · RBV · RDV	Depreciation, book value, remaining depreciable
[↓] (back to YR) [CPT]	YR = 2	Next year — values update

Year	Straight-line	DDB (200%)	SYD
1	9,000	20,000	15,000
2	9,000	12,000	12,000
3	9,000	7,200	9,000
4	9,000	4,320	6,000
5	9,000	1,480*	3,000
Total	45,000	45,000	45,000

- ✦ $SL = (Cost - Salvage) \div Life$. $DDB = (2 \div Life) \times \text{opening book value}$, ignoring salvage — but never below it.
- ✦ *Year 5 DDB is capped at $6,480 - 5,000 = 1,480$; watch RDV.
- ✦ $SYD \text{ year } 1 = 45,000 \times 5 \div 15$.

Bonds Issued at a Discount — Effective Interest Method

NUMERICAL EXAMPLE

3-year 5% annual-coupon bonds, face ₹1,00,000, market rate 6% at issue

Keystrokes	Display	What it means
[2ND] [CLR TVM] 3 [N] 6 [I/Y] 5000 [PMT] 100000 [FV] [CPT] [PV]	PV = −97,326.99	Issue proceeds = initial carrying value
[×] 0.06 [=]	5,839.62	Year-1 interest expense (market rate × carrying value)
2 [N] [CPT] [PV]	PV = −98,166.61	Shortcut: closing carrying value = PV of remaining flows

Year	Opening CV	Interest expense (6%)	Coupon paid (5%)	Discount amortised	Closing CV
1	97,326.99	5,839.62	5,000.00	839.62	98,166.61
2	98,166.61	5,890.00	5,000.00	890.00	99,056.60
3	99,056.60	5,943.40	5,000.00	943.40	1,00,000.00

KEY-WORD CLUSTER

What the analyst tests

- ✦ Interest expense = market rate at issue × opening carrying value; coupon paid = coupon rate × face.
- ✦ Discount bond: interest expense > coupon, carrying value rises to par. Premium bond: the reverse.
- ✦ Cash flow statement: coupon paid (not interest expense) is the operating (US GAAP) outflow.

Lease Liabilities, Growth Rates & Present Values in FSA

NUMERICAL EXAMPLE

Lessee: 5 annual payments of ₹10,000 IN ADVANCE, rate 7%

Keystrokes	Display / Result
[2ND] [BGN] [2ND] [SET] [2ND] [QUIT]	BGN
[2ND] [CLR TVM] 5 [N] 7 [I/Y]	
10000 [+/-] [PMT] 0 [FV]	
[CPT] [PV]	Liability = 43,872.11
[-] 10000 [=] [*] 0.07 [=]	Yr-1 interest = 2,371.05

EXAM TIP Payments in advance → BGN mode. The first payment reduces the liability immediately, so year-1 interest is on 33,872.11. Reset to END afterwards.

NUMERICAL EXAMPLE

Compound annual growth rate (CAGR)

Revenue grew from ₹120 crore to ₹180 crore over 4 years

Keystrokes	Display / Result
[2ND] [CLR TVM] 4 [N]	
120 [+/-] [PV] 180 [FV] 0 [PMT]	
[CPT] [I/Y]	CAGR = 10.67%

Power-key alternative	Display
180 [÷] 120 [=] [y ^x] 4 [1/x] [=] [-] 1 [=]	0.1067

✦ Same approach gives EPS growth, dividend growth or sustainable-growth checks.

10

Derivatives

Forward pricing with discrete and continuous compounding, forward value, FRAs, currency forwards, swap rates, put–call parity and binomial pricing

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Forward Pricing — Discrete & Continuous Compounding](#)
- [FRAs, Currency Forwards & Swap Fixed Rates](#)
- [Options — Put–Call Parity & One-Period Binomial Model](#)

Forward Pricing — Discrete & Continuous Compounding

FORMULA

$F_0(T) = S_0(1 + r)^T$ $F_0(T) = S_0 e^{(rT)}$ $F_0(T) = S_0 e^{((r - q)T)}$ $V_t(\text{long}) = S_t - F_0(T) \div (1 + r)^{(T - t)}$

NUMERICAL EXAMPLE

$S_0 = 100, r = 5\%, T = 6 \text{ months}$

Problem	Keystrokes	Result
Forward price, annual compounding	1.05 [y ^x] 0.5 [×] 100 [=]	102.47
Forward price, continuous compounding	0.05 [×] 0.5 [=] [2ND] [e ^x] [×] 100 [=]	102.53
With a 2% continuous dividend yield	[(1 0.05 [−] 0.02)] [×] 0.5 [=] [2ND] [e ^x] [×] 100 [=]	101.51
Value of the long forward after 3 months if $S_t = 104$	104 [−] 102.4695 [÷] 1.05 [y ^x] 0.25 [=]	+2.77
Cost of carry: PV of income 1.50 reduces S_0	[(1 100 [−] 1.5)] [×] 1.05 [y ^x] 0.5 [=]	100.93

EXAM TIP At initiation a forward has zero value; its value later is the spot price minus the PV of the locked-in forward price.

FRA, Currency Forwards & Swap Fixed Rates

[◀ Back to Index](#)

NUMERICAL EXAMPLE

Three pricing formulas built on discount factors

Problem	Formula	Keystrokes	Result
3×9 FRA rate: 90-day MRR 2%, 270-day MRR 3% (360-day year)	$((1 + r_{270} \times 270/360) \div (1 + r_{90} \times 90/360) - 1) \times 360/180$	<code>[(1 [+] 0.03 [*] 270 [÷] 360 []) [÷] [(1 [+] 0.02 [*] 90 [÷] 360 []) [-] 1 [=] [*] 2 [=]</code>	3.48%
1-yr USD/INR forward: S = 83.00 INR per USD, i(INR) 7%, i(USD) 5%	$F = S \times (1 + i_{price}) \div (1 + i_{base})$	<code>83 [*] 1.07 [÷] 1.05 [=]</code>	84.58
Swap fixed rate: DF ₁ 0.97, DF ₂ 0.94, DF ₃ 0.91	$s = (1 - DF_N) \div \sum DF$	<code>[(1 [-] 0.91 []) [÷] [(1 0.97 [+] 0.94 [+] 0.91 []) [=]</code>	3.19%
Discount factor from a 3-yr spot rate of 5%	$DF = 1 \div (1 + z)^T$	<code>1.05 [y*] 3 [=] [1/x]</code>	0.8638

Interest-rate parity check

Higher-rate currency (INR) trades at a forward DISCOUNT: 84.58 > 83.00 INR per USD.

Swap = series of forwards

The fixed swap rate makes PV(fixed leg) = PV(floating leg) at inception, so value = 0.

Options — Put–Call Parity & One-Period Binomial Model

FORMULA

Put–call parity

$$c_0 + K \div (1 + r)^T = p_0 + S_0$$

NUMERICAL EXAMPLE

S = K = 50, r = 5%, T = 1, c = 6.00

Keystrokes	Display / Result
6 [+] 50 [÷] 1.05 [-] 50 [=]	p ₀ = 3.62

FORMULA

Binomial

$$q = (1 + r - d) \div (u - d) \quad c_0 = (q c_u + (1 - q) c_d) \div (1 + r)$$

S₀ = 100
u = 1.20, d = 0.80
r = 5%, K = 100



At T = 1
Up: S_u = 120 → c_u = 20, p_u = 0
Down: S_d = 80 → c_d = 0, p_d = 20

KEYSTROKES

Binomial call & put

Keystrokes	Display	What it means
[(1 1.05 [-] 0.8 [D]) [÷] [(1 1.2 [-] 0.8 [D]) [=]]	q = 0.625	Risk-neutral probability
0.625 [*] 20 [÷] 1.05 [=]	c ₀ = 11.90	Call value
[(1 1 [-] 0.625 [D]) [*] 20 [÷] 1.05 [=]]	p ₀ = 7.14	Put value
20 [÷] [(1 120 [-] 80 [D]) [=]]	h = 0.50	Hedge ratio (shares per call)
100 [-] 100 [÷] 1.05 [=]	4.76	Parity check: c ₀ - p ₀ = 4.76 ✓

EXAM TIP Risk-neutral q is NOT the real-world probability of an up move — the expected payoff is discounted at the risk-free rate.



Quick Reference & Exam-Day Traps

Every worksheet on one page and the ten keystroke mistakes that cost the most marks

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Worksheet Cheat Sheet — Every BA II Plus Worksheet on One Page](#)
- [Top 10 Calculator Traps on Exam Day](#)

Worksheet Cheat Sheet — Every BA II Plus Worksheet on One Page

Worksheet	Open with	Variables	CFA Level I uses
Time value of money	[N] [I/Y] [PV] [PMT] [FV]; clear: [2ND] [CLR TVM]	N, I/Y, PV, PMT, FV; P/Y, C/Y; BGN/END	PV/FV, loans, annuities, bond price & YTM, CAGR, leases
Cash flow	[CF], then [NPV] / [IRR]	CF0, C01–C24, F01–F24; I, NPV; IRR	NPV, IRR, MWRR, multi-stage DDM, uneven streams
Amortization	[2ND] [AMORT]	PI, P2, BAL, PRN, INT	Loan & amortizing-bond schedules
Interest conversion	[2ND] [ICONV]	NOM, EFF, C/Y	Stated $\rightleftharpoons$ effective rates, BEY $\rightarrow$ EAY
Data & statistics	[2ND] [DATA]; [2ND] [STAT]	Xnn, Ynn; n, $\bar{x}$, Sx, σ_x , $\bar{y}$, Sy, σ_y , a, b, r, X', Y'	Mean, SD, variance, covariance, correlation, regression
Depreciation	[2ND] [DEPR]	LIF, M01, DB, CST, SAL, YR, DEP, RBV, RDV	SL, SYD and declining-balance schedules
Bond	[2ND] [BOND]	SDT, CPN, RDT, RV, ACT/360, 2/Y, YLD, PRI, AI	Price / yield between coupon dates
Date	[2ND] [DATE]	DT1, DT2, DBD, ACT/360	Day counts for accrued interest & money market
Memory	[STO] n, [RCL] n, [2ND] [MEM]	M0 – M9	Hold intermediate results at full precision
Format	[2ND] [FORMAT]	DEC, DEG, date, separator, Chn/AOS	Decimal places and calculation method

Top 10 Calculator Traps on Exam Day

1

P/Y left at 12

Factory default. Check with **[2ND] [P/Y]** — set 1 and convert N and I/Y yourself.

2

BGN mode left on

After an annuity-due or lease problem, switch back to END.

3

TVM not cleared

Old PMT or FV values linger. Press **[2ND] [CLR TVM]** every time.

4

Sign convention

Error 5 when PV and FV share a sign — enter the outflow as negative.

5

Chain vs AOS

In Chain mode $3 + 2 \times 4 = 20$. Use AOS or brackets **[(1)]**.

6

Sx vs σx

Sample data $\rightarrow Sx$; probability distribution or population $\rightarrow \sigma x$.

7

I/Y as a decimal

Type 8 for 8%, not 0.08 — TVM, CF and ICONV all expect percent.

8

Semi-annual bonds

Double N, halve the coupon and the yield; multiply a computed I/Y by 2.

9

CF worksheet

Clear it, remember Fnn defaults to 1, and put terminal value in the last CF.

10

Rounding too early

Set DEC = 9 and store intermediate values in M0–M9.

ABOUT THE AUTHOR

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