JS INSIGHTS

INDEPENDENT STUDY RESOURCE

CFA Level I Formula Sheet

Key formulas, notation and exam-use notes

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INSIDE THIS SHEET

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About this formula sheet

This reference distils the core quantitative content of the CFA® Level I curriculum into one place. It is organised by the ten official topic areas, with each formula accompanied by a brief definition of its variables and, where useful, a short *Use when* prompt or *Trap* warning. It is a memory aid for candidates who already understand the underlying concepts — not a substitute for the curriculum itself.

How the cards are marked

- **USE WHEN** the situation that selects this formula over a similar one.
- **TRAP** a common error — a units mismatch, a sign, or a misread.
- **CALC** a note on the approved financial calculator.

Notation guide

Symbols recur across topics; match every rate to the period of its cash flows.

$PV,\ FV$	present / future value
PMT	periodic payment (annuity)
N	number of periods
I/Y	calculator periodic rate
$r,\ R$	interest rate / return
r_s	stated annual rate
$E(R)$	expected return
R_f	risk-free rate
g	growth rate
b	earnings retention rate
$\sigma,\ \sigma^2$	standard deviation / variance
s^2	sample variance
Cov	covariance
ρ	correlation coefficient
β	beta (systematic risk)
$z,\ t$	test statistics
$D,\ D_p$	dividend / preferred dividend
P_0	current price
EPS	earnings per share
EBIT	earnings before interest & tax
NOI	net operating income
CFO	cash flow from operations
FCFF	free cash flow to the firm
FCFE	free cash flow to equity
WACC	weighted average cost of capital
DDM	dividend discount model
CAPM	capital asset pricing model
P/E	price-to-earnings multiple
NAV	net asset value
VaR	value at risk

LGD	loss given default	X	option exercise price
D_{Mac}	Macaulay duration	$F_0,\ S_0$	forward / spot price
ModDur	modified duration	t (tax)	marginal tax rate

Quantitative Methods

FOUNDATION TOOL

Interest rate building blocks & periodic rates

$$r \approx r_{\text{real risk-free}} + \text{inflation prem.} + \text{default} + \text{liquidity} + \text{maturity prem.}$$

$$\text{EAR} = \left(1 + \frac{r_s}{m}\right)^m - 1 \qquad \text{EAR}_{\text{cont.}} = e^{r_s} - 1$$

where: r_s stated annual rate, m compounding periods per year.

TRAP Convert a stated rate to its *periodic* rate before any TVM step.

Time value of money

$$FV = PV(1+r)^N \qquad PV = \frac{FV}{(1+r)^N}$$

$$PV_{\text{annuity}} = PMT \cdot \frac{1-(1+r)^{-N}}{r} \qquad FV_{\text{annuity}} = PMT \cdot \frac{(1+r)^N - 1}{r}$$

$$PV_{\text{perpetuity}} = \frac{PMT}{r} \qquad PV_{\text{growing perp.}} = \frac{PMT_1}{r-g}$$

where: annuity *due* = ordinary annuity $\times(1+r)$.

CALC Set `P/Y` and `C/Y`, clear `TVM`, mind `BGN/END` mode; one cash-flow sign must differ.

Return measures

$$\text{HPR} = \frac{P_1 - P_0 + I_1}{P_0} \qquad R_{\text{geom}} = \left[\prod_{i=1}^{n}(1+R_i)\right]^{1/n} - 1$$

$$\bar{R}_{\text{arith}} = \frac{1}{n}\sum R_i \qquad R_{\text{harmonic}} = \frac{n}{\sum(1/x_i)}$$

USE WHEN geometric for past compound performance; arithmetic for a single-period expectation.

TRAP Money-weighted return = IRR of cash flows (sensitive to timing of deposits); time-weighted return removes cash-flow timing — use it to judge the *manager*.

Dispersion, co-movement & the Sharpe ratio

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1} \qquad \rho_{xy} = \frac{\text{Cov}(x,y)}{\sigma_x\,\sigma_y}$$

$$\text{CV} = \frac{s}{\bar{x}} \qquad \text{Sharpe} = \frac{\bar{R}_p - R_f}{\sigma_p}$$

where: population variance divides by n; sample variance by $n-1$. $-1 \le \rho \le 1$.

USE WHEN CV to compare relative risk across series with different means; Sharpe for excess return per unit of total risk.

Distributions, sampling & confidence

$$z = \frac{x - \mu}{\sigma} \qquad \text{SF Ratio} = \frac{E(R_p) - R_L}{\sigma_p} \ \text{(maximise)}$$

$$\text{Std. error} = \frac{\sigma}{\sqrt{n}} \qquad \text{CI} = \bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

where: two-sided reliability factors: 90% → 1.645, 95% → 1.96, 99% → 2.58.

TRAP Roy's safety-first chooses the portfolio with the *highest* SF ratio (lowest shortfall probability).

Hypothesis testing & simple linear regression

$$\text{test stat} = \frac{\hat{\theta} - \theta_0}{s_{\hat{\theta}}} \qquad \hat{Y} = b_0 + b_1 X$$

$$b_1 = \frac{\text{Cov}(X, Y)}{\sigma_X^2} \qquad b_0 = \bar{Y} - b_1 \bar{X} \qquad R^2 = \frac{\text{SST} - \text{SSE}}{\text{SST}}$$

where: reject H_0 when |test stat| > critical value, or when p-value < α.

TRAP A one-sided alternative (> or <) puts all of α in one tail — use the one-tailed critical value.

Economics FOUNDATION TOOL

Elasticities

$$E^d_{\text{price}} = \frac{\%\,\Delta Q_d}{\%\,\Delta P} \qquad E_{\text{income}} = \frac{\%\,\Delta Q_d}{\%\,\Delta\,\text{Income}} \qquad E_{\text{cross}} = \frac{\%\,\Delta Q_x}{\%\,\Delta P_y}$$

where: demand is elastic if $|E^d_{\text{price}}| > 1$. Income elasticity $< 0 \Rightarrow$ inferior good; cross $> 0 \Rightarrow$ substitutes.

TRAP Price elasticity is negative; the exam usually quotes its absolute value.

Output, inflation & money

$$\text{GDP} = C + I + G + (X - M) \qquad M \cdot V = P \cdot Y$$

$$(1 + r_{\text{nominal}}) = (1 + r_{\text{real}})(1 + \pi) \ \approx \ r_{\text{real}} + \pi$$

where: π inflation, V velocity, Y real output. Potential GDP growth ≈ growth in labour + growth in labour productivity.

Exchange rates & cross rates

$$\text{Quote } P/B: \text{ units of price currency } P \text{ per 1 base } B \qquad \frac{A}{C} = \frac{A}{B} \times \frac{B}{C}$$

$$\%\,\Delta(\text{base}) = \frac{S_1}{S_0} - 1$$

where: a higher P/B rate means the base currency has appreciated.

TRAP Always identify base vs price currency first; invert a quote with $1/S$ when the base is on the wrong side.

Forward exchange rate (covered interest rate parity)

$$F_{P/B} = S_{P/B} \cdot \frac{1 + r_P \cdot \frac{\text{days}}{360}}{1 + r_B \cdot \frac{\text{days}}{360}}$$

where: r_P, r_B are the price- and base-currency interest rates. Forward points $= F - S$.

USE WHEN the currency with the *higher* interest rate trades at a forward *discount*.

Financial Statement Analysis

FOUNDATION TOOL

Statement anchors & cash flow

$$\text{Assets} = \text{Liabilities} + \text{Equity} \qquad \text{Basic EPS} = \frac{\text{Net income} - \text{Pref. dividends}}{\text{Wtd. avg. common shares}}$$

$$\text{FCFF} = \text{CFO} + \text{Int}(1 - t) - \text{FCInv} \qquad \text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}$$

where: FCInv = net capital expenditure; t marginal tax rate.

TRAP Under IFRS, interest paid may sit in CFO or CFF; classification changes CFO — read the policy note.

Liquidity & activity ratios

$$\text{Current} = \frac{\text{Current assets}}{\text{Current liab.}} \qquad \text{Quick} = \frac{\text{Cash} + \text{Mkt. sec.} + \text{Receivables}}{\text{Current liab.}}$$

$$\text{DSO} = \frac{365}{\text{Receivables turnover}} \qquad \text{DOH} = \frac{365}{\text{Inventory turnover}}$$

$$\text{Cash conversion cycle} = \text{DOH} + \text{DSO} - \text{Days payable}$$

where: inventory turnover = COGS / avg. inventory; receivables turnover = revenue / avg. receivables.

Solvency & profitability

$$\text{D/E} = \frac{\text{Total debt}}{\text{Total equity}} \qquad \text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest expense}}$$

$$\text{Net margin} = \frac{\text{Net income}}{\text{Revenue}} \qquad \text{ROA} = \frac{\text{Net income}}{\text{Avg. assets}} \qquad \text{ROE} = \frac{\text{Net income}}{\text{Avg. equity}}$$

DuPont decomposition of ROE

$$\text{ROE} = \underbrace{\frac{\text{NI}}{\text{Revenue}}}_{\text{net margin}} \times \underbrace{\frac{\text{Revenue}}{\text{Avg. assets}}}_{\text{asset turnover}} \times \underbrace{\frac{\text{Avg. assets}}{\text{Avg. equity}}}_{\text{leverage}}$$

$$\text{ROE} = \frac{\text{NI}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

USE WHEN decomposing *why* ROE changed — margin, efficiency, or leverage.

Inventory & long-lived assets

$$\text{COGS} = \text{Beg. inv.} + \text{Purchases} - \text{End. inv.} \qquad \text{Inv}_{\text{FIFO}} = \text{Inv}_{\text{LIFO}} + \text{LIFO reserve}$$

$$\text{SL deprec.} = \frac{\text{Cost} - \text{Salvage}}{\text{Useful life}} \qquad \text{DDB rate} = \frac{2}{\text{Useful life}} \text{ (on book value)}$$

TRAP LIFO is permitted under US GAAP but *not* IFRS — adjust before cross-border comparison.

Corporate Issuers

FOUNDATION TOOL

Capital allocation criteria

$$\text{NPV} = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t} \qquad \text{IRR}: \sum_{t=0}^{N} \frac{CF_t}{(1+\text{IRR})^t} = 0$$

$$\text{Profitability index} = \frac{\text{PV of future cash flows}}{\text{Initial outlay}} = 1 + \frac{\text{NPV}}{\text{Initial outlay}}$$

USE WHEN NPV when NPV and IRR conflict (scale / non-conventional cash flows) — accept on NPV.

Weighted average cost of capital

$$\text{WACC} = w_d\, r_d(1-t) + w_p\, r_p + w_e\, r_e$$

$$r_e = R_f + \beta\left[E(R_m) - R_f\right] \quad \text{or} \quad r_e = \frac{D_1}{P_0} + g \qquad r_p = \frac{D_p}{P_p}$$

where: use *target* (market-value) weights; debt cost is after tax.

TRAP Only the cost of debt is tax-adjusted; equity and preferred are not.

Leverage

$$\text{DOL} = \frac{Q(P-V)}{Q(P-V)-F} \qquad \text{DFL} = \frac{\text{EBIT}}{\text{EBIT}-I} \qquad \text{DTL} = \text{DOL} \times \text{DFL}$$

$$Q_{\text{breakeven}} = \frac{F+I}{P-V} \qquad Q_{\text{operating breakeven}} = \frac{F}{P-V}$$

where: P price, V variable cost/unit, F fixed costs, I interest.

Equity Investments ASSET CLASS

Index mechanics & holding return

$$\text{Price-weighted} = \frac{\sum P_i}{\text{divisor}} \qquad w_i^{\text{cap}} = \frac{P_i Q_i}{\sum_j P_j Q_j}$$

$$\text{Total return} = \text{Price return} + \text{Dividend yield}$$

TRAP Price-weighted indexes are biased toward high-*price* shares; the divisor changes on splits.

Dividend discount model (Gordon growth)

$$V_0 = \frac{D_1}{r-g} = \frac{D_0(1+g)}{r-g} \qquad g = b \times \text{ROE} \qquad r = \frac{D_1}{P_0} + g$$

where: b retention $= 1-$ payout ratio. Requires $r > g$ and stable, perpetual growth.

USE WHEN mature, stable dividend payers; unsuitable for high-growth or non-payers.

TRAP V_0 is extremely sensitive to $(r-g)$ — a small denominator swings value sharply.

Multiples & other tools

$$\text{Justified leading } P/E = \frac{1-b}{r-g} \qquad \text{EV} = \text{Mkt. cap} + \text{Debt} - \text{Cash}$$

$$V_{\text{preferred}} = \frac{D_p}{r} \qquad V_0 = \frac{\text{FCFE}_1}{r-g} \text{ (constant-growth FCFE)}$$

where: leading P/E uses next-year EPS; trailing uses last-year EPS.

Fixed Income ASSET CLASS

Bond price, yield & accrued interest

$$P = \sum_{t=1}^{N} \frac{\text{PMT}}{(1+r)^t} + \frac{\text{FV}}{(1+r)^N} \qquad \text{Current yield} = \frac{\text{Annual coupon}}{\text{Price}}$$

$$\text{Full price} = \text{Flat price} + \text{Accrued interest} \qquad \text{AI} = \frac{t}{T} \times \text{PMT}$$

where: r is the periodic YTM; t/T is the fraction of the coupon period elapsed.

TRAP Price and yield move *inversely*; a bond at a premium has coupon > YTM.

Spot, forward & money-market yields

$$(1+z_2)^2 = (1+z_1)\,(1+\,{}_1f_1) \qquad \text{BEY} = \text{HPY} \times \frac{365}{t}$$

where: z_n spot rate for n periods; ${}_1f_1$ one-period rate one period forward; HPY holding-period yield.

USE WHEN chaining spot rates to back out an implied forward rate.

Duration, convexity & price change

$$\text{ModDur} = \frac{D_{Mac}}{1+r} \qquad \text{ApproxModDur} = \frac{V_- - V_+}{2\,V_0\,\Delta y}$$

$$\text{EffDur} = \frac{V_- - V_+}{2\,V_0\,\Delta\text{curve}} \qquad \text{Money duration} = \text{ModDur} \times V_0$$

$$\%\,\Delta P \approx -\,\text{ModDur} \cdot \Delta y \;+\; \tfrac{1}{2}\,\text{Convexity} \cdot (\Delta y)^2$$

where: V_-, V_+ prices after equal yield decrease/increase; PVBP = money duration $\times 0.0001$.

USE WHEN effective duration for bonds with embedded options (cash flows depend on rates).

Credit risk

$$\text{Expected loss} = \text{Prob. of default} \times \text{LGD} \qquad \text{LGD} = 1 - \text{Recovery rate}$$

$$\Delta\text{Price} \approx -\,\text{ModDur} \times \Delta(\text{spread})$$

where: yield = benchmark (government) rate + spread; spread compensates for credit & liquidity risk.

Derivatives ASSET CLASS

Forward / futures pricing (cost of carry)

$$F_0 = S_0(1+r)^T \qquad F_0 = \left[S_0 - \text{PV(income)} + \text{PV(cost)}\right](1+r)^T$$

$$V_t(\text{long forward}) = \frac{F_t - F_0}{(1+r)^{T-t}}$$

where: carry benefits (dividends, coupons) lower F_0; carry costs (storage) raise it.

TRAP Futures are marked to market daily and margined; forwards settle once at expiry.

Option payoffs & put-call parity

$$\text{Long call} = \max(0,\ S_T - X) \qquad \text{Long put} = \max(0,\ X - S_T)$$

$$c + \frac{X}{(1+r)^T} = p + S_0 \qquad \text{(fiduciary call = protective put)}$$

$$c + \frac{X}{(1+r)^T} = p + \frac{F_0}{(1+r)^T} \qquad \text{(put–call–forward parity)}$$

where: profit subtracts the premium paid (or adds the premium received).

One-period binomial valuation

$$\pi = \frac{(1+r) - d}{u - d} \qquad c_0 = \frac{\pi\, c_u + (1-\pi)\, c_d}{1+r}$$

where: u, d up/down price factors; π risk-neutral probability of an up move.

TRAP Risk-neutral probabilities, not real-world ones, discount at the risk-free rate.

Alternative Investments ASSET CLASS

Fund fees

$$\text{Mgmt. fee} = \text{rate} \times \text{AUM (or committed capital)}$$

$$\text{Incentive fee} = \text{rate} \times (\text{profit above hurdle, net of high-water mark})$$

where: "2 and 20" = a 2% management fee and a 20% incentive fee.

TRAP A high-water mark means no incentive fee is charged until prior losses are recovered.

Real estate & commodity returns

$$\text{Cap rate} = \frac{\text{NOI}}{\text{Property value}} \qquad \text{Value} = \frac{\text{NOI}}{\text{Cap rate}}$$

$$\text{Commodity total return} = \text{Price (spot)} + \text{Roll} + \text{Collateral return}$$

where: NOI = rental income − operating expenses (before financing & tax).

USE WHEN backward-looking "contango" (futures > spot) tends to produce a negative roll return.

Portfolio Management

INTEGRATION

Portfolio return & risk

$$E(R_p) = \sum_i w_i\, E(R_i) \qquad \text{Cov}_{12} = \rho_{12}\,\sigma_1\,\sigma_2$$

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

USE WHEN diversification benefit grows as ρ_{12} falls below $+1$.

TRAP Add the covariance term — variance is *not* the weighted average of the parts.

CAPM, the SML and the CML

$$\beta_i = \frac{\text{Cov}(i,m)}{\sigma_m^2} = \rho_{i,m}\,\frac{\sigma_i}{\sigma_m} \qquad E(R_i) = R_f + \beta_i\big[E(R_m) - R_f\big]$$

$$E(R_p) = R_f + \frac{E(R_m) - R_f}{\sigma_m}\,\sigma_p \quad \text{(CML)}$$

where: the SML prices any asset on β; the CML prices efficient portfolios on total risk σ_p.

Performance & utility

$$\text{Treynor} = \frac{R_p - R_f}{\beta_p} \qquad \alpha_{\text{Jensen}} = R_p - \big[R_f + \beta_p(R_m - R_f)\big]$$

$$U = E(R) - \tfrac{1}{2}A\,\sigma^2$$

where: A is the investor's risk-aversion coefficient. IPS constraints: *L*iquidity, *L*egal, *T*ax, *T*ime horizon, *U*nique.

USE WHEN Sharpe / M^2 rank on total risk; Treynor / Jensen's α on systematic risk for well-diversified portfolios.

Ethical and Professional Standards

PROFESSIONAL JUDGEMENT

No formulas – the highest-weighted topic is judgement

This topic is examined through application, not calculation. There is nothing to compute; mastery comes from recognising which Standard a scenario engages and what action it requires.

The seven Standards of Professional Conduct

I. Professionalism

II. Integrity of Capital Markets

III. Duties to Clients

IV. Duties to Employers

V. Investment Analysis, Recommendations, and Actions

VI. Conflicts of Interest

VII. Responsibilities as a CFA Institute Member or Candidate

where: the Global Investment Performance Standards (GIPS) promote fair, comparable, full-disclosure performance reporting.

TRAP Pick the action that satisfies the *strictest* applicable obligation — local law or the Code/Standards, whichever is higher.

Notes for bilingual learners

Study the maths in English, even if you learn the idea in Chinese

- Keep every formula and symbol in **English notation** — do not re-label variables in another script.
- Build a short **English glossary** for the terms that recur in question stems (*discount rate*, *carrying amount*, *coupon*, *yield*, *spread*).
- Practise reading **item stems in English** under time pressure; translate the single concept you are unsure of, not the whole sentence.
- Watch the command words: *most likely*, *least likely*, *best described as*, *all else equal* — they decide the answer.

Final review checklist

For each formula, can you answer "yes" to all five?

1. Can I **recognise** the formula and name it?
2. Can I **define every variable** and its units?
3. Can I **choose the right formula** from the question stem?
4. Can I **calculate** it on the approved calculator without notes?
5. Can I **interpret** the result in one plain sentence?

Sources checked

Topic names and curriculum relevance were checked against CFA Institute's official **2026 Level I Topic Outlines** (retrieved 22 June 2026 from `cfainstitute.org`), cross-referenced with the CFA Program and Candidate Body of Knowledge (CBOK) pages. The ten topic areas and the reading structure used to organise this sheet follow that outline.

The formulas themselves are standard mathematical and financial relationships, rebuilt from first principles and

expressed in original wording and layout; no third-party formula sheet was reproduced. Any Chinese-language reference material was used only as a high-level check on topic coverage. Calculator guidance refers to the two models CFA Institute permits (Texas Instruments BA II Plus family and Hewlett Packard 12C family); confirm the current approved list and exam policy in your candidate resources before exam day.

Official sources: CFA Program overview, Level I exam page, CBOK, and the 2026 Level I Topic Outlines — all at `www.cfainstitute.org`.