Return Formulas

1 Holding Period Return (Total Return)

$$r = (P_1 - P_0 + \text{Income}) / P_0$$
$$\text{Total return} = \text{Price return} + \text{Capital distribution return}$$

Use it when: you need the return over any single period. Divide by P_0 because return is measured on the amount invested.

Example: Bought at ₹100, sold at ₹110, dividend ₹2 → (110 - 100 + 2) / 100 = **12%** (10% price + 2% income).

Watch out: a T-bill pays no coupon, so Income = 0 and its whole return is price return.

2 Annualizing a Period Return (Compounding)

$$r_{annual} = (1 + r_{period})^{365 / t} - 1$$
$$t = \text{number of days in the holding period}$$

Use it when: a return earned over fewer (or more) days than a year must be expressed per year. Compound, because reinvested returns earn return on return.

Example: 90-day T-bill: price 991.55, face 1,000 → r_{90} = 0.8522% → $(1.008522)^{365/90}$ - 1 = **3.50%**.

Watch out: do not multiply by 365/90 (gives 3.456%). The curriculum compounds.

3 Converting an Annual Rate into a Period Rate

$$r_{period} = (1 + r_{annual})^{t / 365} - 1$$

Use it when: you are given an annual rate and need the rate for a shorter period, e.g. to price a T-bill. It is formula 2 run in reverse.

Example: Annual rate 4.0%, 90 days → $(1.04)^{90/365}$ - 1 = **0.9718%**.

4 Price of a T-bill (Discount Instrument)

$$P_0 = \text{Face value} / (1 + r_{period})$$

Use it when: you need today's price of a zero-coupon instrument that pays face value at maturity.

Example: 1,000 / 1.009718 = **990.38**. Rate rose 3.5% → 4.0%, price fell 991.55 → 990.38 = **$1.17**.

Watch out: rates up = price down (the seesaw). Longer maturities fall much more for the same rate change.

5 Domestic Currency Return (Foreign Investment)

$$R_{DC} = (1 + R_{FC}) \times (1 + R_{FX}) - 1$$
$$R_{FX} = (S_1 - S_0) / S_0 \text{ (S = domestic currency per 1 unit of foreign)}$$
$$\text{Shortcut: } R_{DC} = (\text{ending value in DC} - \text{starting value in DC}) / \text{starting value in DC}$$

Use it when: you hold an asset priced in a foreign currency. R_{FC} = local currency return (price + income); R_{FX} = change in the foreign currency's value.

Example: UK share: R_{GBP} = 12%, GBP weakens 4.336% → (1.12)(0.95664) - 1 = **7.14%** for the US investor.

Watch out: multiply, never add (12% - 4.336% = 7.664% is wrong). Currency affects both price and income returns.

6 Arithmetic Mean Return

$$R_A = (R_1 + R_2 + \ldots + R_n) / n$$

Use it when: you want the simple average of single-period returns.

Example: Stock: (50% - 50% + 15%) / 3 = **5%**. Index: (10% - 10% + 3%) / 3 = **1%**.

Watch out: it ignores compounding, so it overstates multiperiod performance of volatile assets.

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7 Geometric Mean Return (Compound Return)

$$R_G = [(1 + R_1)(1 + R_2) \ldots (1 + R_n)]^{1/n} - 1$$

Use it when: you want the return an investor actually earned per period over several periods.
Example: Stock: $[(1.50)(0.50)(1.15)]^{1/3} - 1$ = **−4.81%**. Index: $[(1.10)(0.90)(1.03)]^{1/3} - 1$ = **0.65%**.
Watch out: geometric ≤ arithmetic. Higher volatility = bigger gap (volatility drag).

8 Relative Outperformance (Compound Basis)

$$\text{Outperformance} = (1 + R_A) / (1 + R_B) - 1$$

Use it when: comparing two geometric (compounded) returns.
Example: Large-cap 12.26%, small-cap 11.23% → 1.1226 / 1.1123 − 1 = **0.93%**.
Watch out: not 12.26 − 11.23 = 1.03%, and not 1.03 / 11.23 = 9.17%.

9 Portfolio Expected Return (Weighted Average)

$$E(R_p) = \Sigma\, w_i \times E(R_i) \text{ (weights = asset allocations, sum to 100\%)}$$
$$\text{Total return} = \text{Capital appreciation return} + \text{Capital distribution return}$$

Use it when: computing a portfolio's appreciation, distribution and total return from asset-class returns.
Example: Allocation C (40/50/10): appreciation (8.0×0.40) + (0.5×0.50) + (0×0.10) = 3.45%; distribution (3.0×0.40) + (5.0×0.50) + (2.5×0.10) = 3.95%; total **7.40%**.

10 Range (Simple Risk Measure)

$$\text{Range} = \text{Highest return} - \text{Lowest return}$$

Use it when: you need a quick measure of how variable returns are. Wider range = more risk.
Example: Returns −20%, 10%, 40% → range = 40 − (−20) = **60%**.

Key Relationships to Remember

Interest rates ↑	Bond prices ↓ (negative price return); coupon income stays positive.
Longer maturity	Bigger price change for the same rate change; higher expected return.
Issuer default risk ↑	Bond price ↓; corporate bonds earn a credit spread over government bonds.
Foreign currency strengthens	Domestic currency return ↑. Foreign currency weakens: return ↓.
Volatility ↑	Geometric (compound) return ↓ relative to arithmetic return.
Equities	Mostly price return; dividends are a variable distribution.
Bonds	Mostly fixed coupon (fixed distribution); some price return. Floating-rate notes = variable.
Risk-return tradeoff	Expected long-term return: equities > corporate bonds > government bonds; small-cap > large-cap.
Diversification	Removes unsystematic (micro) risk only. Systematic (macro) risk remains.
Systematic risks	Inflation, interest rate, market. Unsystematic: issuer (business, financial, credit), sector.
Retired / income need	More fixed income. Growth need: more equity. Both: balanced.

BA II Plus tip: for any power, key the base, press **y^x**, key the exponent (e.g. 365 ÷ 90 in brackets), press **=**, then subtract 1. For a cube root, use exponent (1 ÷ 3).

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