Measuring Portfolio Returns (Module 3.1)

1 Money-Weighted Return (MWR) = IRR

$$\text{PV(inflows)} = \text{PV(outflows)}$$
$$CF_0 + CF_1/(1 + r) + CF_2/(1 + r)^2 + \ldots = 0 \text{ (signs: money in vs money out opposite)}$$

Use it when: you want the return the **investor** earned, including the timing and size of deposits and withdrawals. Right measure when the manager controls cash flows.

Example: Buy 1 share $100; buy 1 more $120 at t=1 ($2 dividend); sell 2 at $130 at t=2 ($4 dividends) → CF0 = +100, CF1 = +118, CF2 = -264 → IRR = **13.86%**.

Watch out: net all cash flows at each date (e.g. +120 purchase - 2 dividend = +118). Clear the BA II Plus CF worksheet first.

2 Holding Period Return of a Subperiod

$$\text{HPR} = (\text{Ending value} + \text{Income}) / \text{Beginning value} - 1$$

Use it when: computing each piece of a time-weighted return. Start a new subperiod at every deposit or withdrawal.

Example: Year 1: (120 + 2)/100 - 1 = **22%**. Year 2 (2 shares): (260 + 4)/240 - 1 = **10%**.

Watch out: the new subperiod starts from the value **right after** the deposit (2 shares × $120 = $240).

3 Time-Weighted Return (TWR)

$$(1 + \text{TWR})^{\text{years}} = (1 + HPR_1)(1 + HPR_2) \ldots (1 + HPR_n)$$
$$\text{Annual TWR} = [(1 + HPR_1)\ldots(1 + HPR_n)]^{1/\text{years}} - 1$$

Use it when: measuring the **manager's** performance — compound growth of $1, unaffected by client cash flows. Required by GIPS (with exceptions).

Example: (1.22)(1.10) = 1.342 → $1.342^{0.5}$ - 1 = **15.84%**.

Watch out: the exponent is 1 ÷ number of **years**, not 1 ÷ number of subperiods.

4 MWR vs TWR: The Timing Rule

Money added before a strong period → MWR > TWR
Money added before a weak period → MWR < TWR

Use it when: explaining why the two measures differ for the same investment.

Example: Buy 1 share at $50, add 3 at $40 (after -18% year), year 2 +52.5% → MWR **31.92%** vs TWR **11.83%**.

Watch out: MWR weights periods by money invested; TWR weights each period equally.

Security Market Indexes (Module 3.2)

5 Linking Index Returns

$$R_P = (1 + R_1)(1 + R_2) \ldots (1 + R_k) - 1$$

Use it when: combining returns over several periods.

Example: 0.50% and 1.04% → (1.005)(1.0104) - 1 = **1.55%**; index 100 → 101.55.

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6 Price-Weighted Index

Index = Σ Prices / Divisor

New divisor after a split: D_{new} = Σ post-split prices / index value before the split

Use it when: the index is an arithmetic average of prices (e.g. DJIA, Nikkei 225).

Example: (10 + 20 + 60)/D = 100 → D = 0.9; later (20 + 15 + 40)/0.9 = **83.33**. Split: \$90 → \$45, (5 + 25 + 45)/D = 100 → D = **0.75**.

Watch out: high-priced stocks dominate. Divisor changes for splits, reverse splits, stock dividends and composition changes.

7 Equal-Weighted Index Return

Index return = (1/N) Σ R_i (simple average of the price changes)

Shares per stock = equal reference value / price; Divisor = total value / base

Use it when: every stock has the same weight at the start of the period.

Example: (25% - 7.7% + 18.4%)/3 = **11.9%**; index 15,600/156 = 100 → 17,458/156 = 111.9.

Watch out: weights drift as prices move — the index needs frequent rebalancing.

8 Market-Cap-Weighted Index (incl. float-adjusted)

Index = Σ ($Price_i$ × $Shares_i$) / Divisor

Return = Ending total market value / Beginning total market value − 1

Float-adjusted: use only shares available to investors

Use it when: weights reflect each company's share of total market value (e.g. S&P 500, Nifty 50, Sensex).

Example: \$80m → \$95m, D = 800,000 → **118.75**. Quiz: 1,290m/1,260m - 1 = **2.38%**.

Watch out: no divisor change for splits or stock dividends (market cap is unchanged).

9 Price Return vs Total Return of an Index

Price index = Σ N_i × $P_{i,1}$ / D

Return index = Σ N_i × ($P_{i,1}$ + $Distribution_i$) / D

Use it when: the index's constituents pay dividends or interest.

Example: 41.3m/400,000 = **103.25** (3.25%) vs 42.6m/400,000 = **106.50** (6.5%).

Watch out: fund performance should be compared with a total return index.

10 Rebalancing an Equal-Weighted Index

Target $shares_i$ = (Total value / N) / $Price_i$; Trade = target − current

Use it when: restoring equal weights after prices change.

Example: 17,457.8/3 = 5,819.27 → A: 5,819.27/15 = 387.95 vs 433.33 held → **sell 45.38**.

Watch out: rebalancing sells winners and buys losers.

BA II Plus — IRR: [CF] [2nd] [CLR WORK] · CF0 [ENTER] · [↓] C01 [ENTER] · [↓] F01 (leave 1) · [↓] C02 … · [IRR] [CPT]. Enter money in and money out with **opposite signs**; use [+/-] for negatives.

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