CHARTA LEARNING · LESSON NOTES

Performance and returns of alternative investments

CFA Level I · Alternative Investments

You will learn: Choose between the time-weighted return and the IRR, see how appraisal smoothing hides risk and how to unsmooth it, and use downside deviation, the Sortino ratio, maximum drawdown and value at risk for returns that are not normal.

Running example: Examples follow Harbor Capital's made-up funds (£ millions): a growth fund starting at £10m that earns 10% in year 1, takes in £90m, then loses 5% in year 2. Examples use made-up figures.

1. Time-weighted return

- Cut the period into sub-periods at every cash flow, find the plain return in each, then chain the growth factors (1 plus the return) by multiplying, and subtract one.
- A pound earns its return whether the fund held £10m or £100m when it earned it. The size of the money, and so the investor's timing, drops out completely. The manager is not marked on when the client added money.

$$TWR = (1 + R_1) \times (1 + R_2) \times \ldots \times (1 + R_n) - 1$$

HARBOR GROWTH FUND

Start: £10m; year 1 +10%	10m grows to 11m	**factor 1.10**
Client adds £90m: fund £101m; year 2 −5%	101m falls to 95.95m	**factor 0.95**
Multiply	1.10 × 0.95	**1.045**
Time-weighted return	1.045 − 1	**+4.5% (about 2.2% a year)**

2. IRR, and which measure fits which fund

- The internal rate of return (IRR), or money-weighted return, uses the investor's actual cash flows: paid in is negative, received or final value positive. It is the one discount rate that makes the present value of all flows zero. Big balances sit invested longer and carry more weight.
- Time-weighted and IRR disagree because the good year was small and the bad year was huge. TWR gives each year the same vote; the IRR lets the big balance dominate. Both are right, answering different questions.
- Ask who decides when money goes in and out. Open-ended fund (and hedge fund open to redemptions): investors time the flows, so judge the manager by TWR. Private fund (private equity, most real estate and infrastructure): the general partner times the cash, so use the IRR.
- Never compare a private fund's IRR with a public index's TWR: the first counts the timing of cash, the other deliberately ignores it.

$$0 = CF_0 + CF_1 \div (1 + IRR) + CF_2 \div (1 + IRR)^2 + \ldots$$

IRR CASES

Growth fund, client's flows (£m)	−10 at t0, −90 at t1, +95.95 at t2	**IRR −3.7%**
Cedar Private Equity: called 40 and 60; paid back 30, 50, 90	170 ÷ 100	**1.70×; IRR 21.6%**
Asset bought for 100, sold for 150 in year 3: cash called at year 0		**IRR 14.5%**
Same asset, cash called at year 2	same £50m gain, same 1.5×	**IRR 50.0%**

Watch out: Using TWR for a private fund where the manager controls the cash, or the IRR where investors control it.

3. Appraisal, valuation lag and smoothing

- Unlisted property, private equity and infrastructure rarely trade, so they are valued by appraisal. The appraiser leans on old comparable sales and on their own last valuation, and is cautious about sharp changes. Reported values lag the market and move less: a sluggish thermometer.
- The standard model: reported return = (1 − φ) × true return + φ × last reported return. φ is the weight on the old number. φ = 0 means no smoothing; the bigger φ is, the smoother the series.
- Smoothing leaves the average return almost unchanged but hides the size and timing of swings. Reported volatility and correlation with the market are understated, and the Sharpe ratio is flattered. Smoothing is mostly the honest result of appraisal, not cheating.

Reported = (1 − φ) × true + φ × last reported

HARBOR PROPERTY FUND, Φ = 0.5

Quarter 2: true −12%	0.5 × (−12) + 0.5 × 4	**reported −4%**
Quarter 3: true −6%	0.5 × (−6) + 0.5 × (−4)	**reported −5%**
Quarter 4: true +8%	0.5 × 8 + 0.5 × (−5)	**reported +1.5%**
Volatility a year, true vs reported (8 quarters)	7.26% × 2; 3.73% × 2	**14.5% vs 7.5%**
Correlation with the market; Sharpe true vs reported		**0.87; 0.17 vs 0.35**

4. Unsmoothing and the optimiser

- Unsmoothing undoes the lag: subtract the part that repeats the last reported return, then scale the rest back up. In practice φ must be estimated, so the result is only an estimate, but it gives a higher volatility and higher correlation with public markets, the honest picture.
- A mean-variance optimiser fed raw reported numbers overweights the asset: halving the volatility makes the variance four times smaller, so the weight is four times too large.

True = (reported − φ × last reported) ÷ (1 − φ); weight = extra return ÷ (risk aversion × variance)

UNSMOOTHING (Φ = 0.5) AND THE OPTIMISER (EXTRA RETURN 6%, RISK AVERSION 10)

Quarter 2	(−4 − 0.5 × 4) ÷ 0.5	**−12%**
Quarter 3	(−5 − 0.5 × (−4)) ÷ 0.5	**−6%**
Quarter 4	(1.5 − 0.5 × (−5)) ÷ 0.5	**+8%**
Weight using reported vol 10%	0.06 ÷ (10 × 0.01)	**60%**
Weight using unsmoothed vol 20%	0.06 ÷ (10 × 0.04)	**15%, so 4 times too large**

Watch out: Forgetting that unsmoothing raises volatility and correlation, not lowers them.

5. Returns that are not normal: downside risk

- Selling options, credit lending and short-volatility trades give many small gains and rare large losses: negative skew (a long tail on the loss side) and fat tails (extremes likelier than a bell curve). Standard deviation counts up and down alike, so it misleads here.
- Downside deviation counts only returns below a target, the minimum acceptable return (MAR). For each return take the shortfall (zero if none), square, add, divide by n − 1, take the square root.
- The Sortino ratio replaces the standard deviation in the Sharpe ratio with the downside deviation, so a fund whose volatility is all on the good side scores well.

Downside deviation = √[Σ min(0, R − MAR)² ÷ (n − 1)]; Sortino = (mean − MAR) ÷ downside deviation

TWO FUNDS, 8 MONTHS, MEAN 4%, TARGET 0%

Standard deviation: Up, Down		**6.4 and 5.7**
Sharpe: Up, Down	mean ÷ std dev	**0.62 and 0.71**
Downside deviation: Up, Down	months below 0 only	**1.51 and 3.78**
Sortino: Up, Down	mean ÷ downside dev	**2.65 and 1.06**
Short-volatility strategy, 35 months	34 gains, then −19%	**hit rate 97%; std dev 3.35%; worst month 5.7 std devs below the mean**

6. Maximum drawdown and value at risk

- A drawdown is the fall from the latest peak to the lowest point afterwards. Maximum drawdown is the biggest such fall in the period, the pain a real investor felt. Recovering needs a larger gain than the fall.
- Value at risk (VaR) is the loss expected not to be exceeded at a chosen confidence level. Normal VaR is the mean minus z standard deviations (1.645 at 95%, 2.33 at 99%); historical VaR sorts past returns. Normal VaR understates fat tails; neither shows losses beyond the cut-off.
- No single measure is enough. Standard deviation: up and down. Downside deviation and Sortino: below target. Maximum drawdown: peak to trough. VaR: a cut-off. Understand the payoff: a strategy that sells options or insurance has negative skew and fat tails.

Normal VaR = −(mean − z × s); maximum drawdown = (trough − peak) ÷ peak

CREDIT FUND AND THE 35-MONTH STRATEGY

Fund values 100, 108, 115, 104, 92, 98, 112	(92 − 115) ÷ 115	**maximum drawdown −20%**
Gain needed to recover	115 ÷ 92 − 1	**+25%**
z × std dev (mean 0.23%, std dev 3.35%)	1.645 × 3.35	**5.51**
95% monthly VaR	0.23 − 5.51 = −5.28	**loss of 5.3%**
Actual worst month beyond VaR	19 − 5.3	**13.7 points**

Key takeaways

- TWR strips out the timing of cash flows; the IRR includes it. Ask who controls the timing.
- Use TWR for open funds where investors time the flows, and the IRR for private funds where the manager does.
- Never put a private IRR beside an index TWR as a like-for-like comparison.
- Appraisal lag smooths returns: volatility and correlation are understated and the Sharpe ratio is flattered. Unsmoothing raises risk.
- For skewed, fat-tailed returns use downside deviation, the Sortino ratio and maximum drawdown, and use VaR with care.
- Read the strategy's payoff as well as the numbers.

Quick check

1. General partner decides when capital is called. Which return measure?
   Answer: The IRR: the manager controls the timing.
2. Reported volatility is 7%. What does unsmoothing do to it?
   Answer: It raises it; the Sharpe ratio falls.
3. Mean 4%, target 0%, downside deviation 2%. Sortino ratio?
   Answer: (4 − 0) ÷ 2 = 2.0.

Summary notes for the Charta whiteboard lesson. Examples use made-up figures. Watch the full lesson at charta-learning.com.