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FORMULA SHEET

# CAIA Level I

Chartered Alt. Investment Analyst

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FORMULAS

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TOPICS

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## INTRODUCTION TO ALTERNATIVE INVESTMENTS

5 items

### TVPI (Total Value to Paid-In)

$$\text{TVPI} = \frac{\text{Distributions} + \text{Residual NAV}}{\text{Paid-in Capital}}$$

TVPI = DPI + RVPI. >1.0 = fund has created net value (non-time-adjusted).

### RVPI (Residual Value to Paid-In)

$$\text{RVPI} = \frac{\text{Residual NAV}}{\text{Paid-in Capital}}$$

Unrealized multiple. TVPI = DPI + RVPI. High RVPI = mark-based value subject to valuation uncertainty.

### DPI (Distributions to Paid-In)

$$\text{DPI} = \frac{\text{Cumulative Distributions}}{\text{Paid-in Capital}}$$

Realized multiple. DPI > 1.0 = fund returned more than paid-in. Key metric for mature funds.

### What is the order of distributions in the standard PE waterfall (preferred return + GP catch-up), and what is the GP's net take?

Order: (1) LP return of capital, (2) LP pref return (often 8% IRR hurdle), (3) GP catch-up (100% to GP until 20% of total profit), (4) 80/20 split.

Net effect: GP gets 20% of profit above hurdle.

### MOIC (Multiple on Invested Capital)

$$\text{MOIC} = \frac{\text{Total Value (Realized + Unrealized)}}{\text{Invested Capital}}$$

MOIC uses INVESTED (deployed) capital; TVPI uses PAID-IN (includes fees). MOIC is cleaner for deal-level performance.

## REAL ASSETS

2 items

### Direct capitalization (real estate)

$$V = \frac{NOI}{\text{Cap Rate}}$$

NOI = Gross rent − Vacancy − Opex (excl. debt, tax, depr).

Cap rate $= r - g$ (implicit constant growth). Lower cap rate $\Rightarrow$ higher prices/rent growth.

### Loan-to-Value (LTV) and Debt Service Coverage Ratio (DSCR)

$$\text{LTV} = \frac{\text{Loan}}{\text{Property Value}}$$

$$\text{DSCR} = \frac{NOI}{\text{Annual Debt Service}}$$

LTV: leverage (commercial: 60-75%). DSCR: cash-flow cushion (covenants $\geq 1.25$).

## PRIVATE EQUITY

1 item

### Money-weighted return (IRR for PE funds)

$$\sum_{t=0}^{T} \frac{CF_t}{(1+\text{IRR})^t} = 0$$

IRR is the rate that zeros NPV. Standard PE fund return; sensitive to LP cash-flow timing (J-curve effect). Pair with KS-PME or Direct Alpha to control for public-market drift.

## HEDGE FUNDS

5 items

### Sortino ratio

$$\text{Sortino} = \frac{R_p - R_T}{\sigma_D}$$

$R_T$ = MAR (often 0 or $r_f$). $\sigma_D$ = downside deviation.

Preferred over Sharpe for non-normal returns (rewards positive skew).

### Modified Sharpe ratio (Cornish-Fisher adjusted)

$$\text{MVaR} = \mu - z'_\alpha \sigma$$

$$z'_\alpha = z_\alpha + (z_\alpha^2 - 1)\frac{S}{6} + (z_\alpha^3 - 3z_\alpha)\frac{K}{24}$$

$S$ = skew, $K$ = excess kurtosis. Adjusts for non-normal tails (HF/PE).

### Information ratio

$$\text{IR} = \frac{R_p - R_b}{\sigma_{R_p - R_b}} = \frac{\text{Active return}}{\text{Tracking error}}$$

Active return per unit of active risk. Targets: 0.5 good, 1.0+ exceptional.

### High-water mark (HWM) fee

Performance fee paid only on $\max(NAV_t - \text{HWM}_{t-1},\ 0)$. HWM ratchets up after each peak; managers must recoup drawdowns before fees resume. Stops fee double-charging on the same dollar.

### Calmar ratio

$$\text{Calmar} = \frac{\text{Annualized Return}}{|\text{Max Drawdown}|}$$

Common in managed futures/HF. Return per unit of worst-case pain. Sensitive to drawdown magnitude (not period-by-period vol).

## ADDITIONAL STRATEGIES

1 item

### Forward exchange rate (covered interest parity)

$$F_{f/d} = S_{f/d} \cdot \frac{1 + r_f}{1 + r_d}$$

$r_f$, $r_d$ = foreign / domestic rates over the same horizon. Deviation signals capital controls or post-2008 cross-currency basis.