## Rates and Returns



## 3. RATES OF RETURN

Two types of financial asset returns are:

1) periodic income (cash dividends or interest payments)
2) capital gain or loss (changes in the price of a financial asset).

Measures the return over a specific period.

Calculated as:
$R=\frac{\left(P_{1}+P_{0}\right)+I_{1}}{P_{0}}-1$

For periods longer than
a year, HPR is
compounded annually.

Sum of all returns divided by the total observations.

Advantages: Easy to compute, commonly used, and facilitates standard deviation calculations to assess variability.


Compound growth rate over multiple periods.

Suitable for a "buy-andhold" strategy.

Calculated as:
$\bar{R}_{G i}=\sqrt{T} \begin{aligned} & \left(1+R_{i 1}\right) \times\left(1+R_{i T}\right)\end{aligned}-1$
Advantage: Provides a more accurate measure of long-term investment returns.

Additional Means for Handling Data Variability

## Trimmed Mean:

Excludes a small \% of the extreme values from both ends of a dataset before calculating the mean.

## Winsorized Mean:

Assigns specified values to the extreme ends of a dataset before averaging, mitigating the impact of outliers.

## 4. MONEY-WEIGHTED AND <br> TIME-WEIGHTED RETURN

| Metric | Money-Weighted Return (MWR) | Time-Weighted Return (TWR) |
| :--- | :--- | :--- |
| Definition | Compound growth rate of all funds <br> over the entire evaluation period | Compound rate of growth for one unit of initially <br> invested money over a specified evaluation period |
| Formula | $\sum_{t=0}^{T} \frac{C F_{t}}{(1+I R R)^{t}}=0$ | Time weighted return $=r_{t w r}=[(1+r t, 1) \times$ <br> $(1+r t, 2) \times \ldots \times(1+r t, n)]^{1 / N}-1$ |
| Representation | Internal Rate of Return (IRR) | Actual rate of return earned by the portfolio <br> manager |
| Consideration of <br> Cash Flows | Takes into account the timing and size <br> of cash flows | Does not consider the timing and size of cash <br> flows |
| Comparative <br> Analysis | Can be used to compare different <br> investments with varying cash flow <br> patterns | Cannot be used to compare different investments |
| Common Usage | L | More commonly used to evaluate portfolio <br> manager performance |
| Sensitivity to <br> Cash Flows | Sensitive to timing and size of cash <br> flows | Not sensitive to timing and size of cash flows |
| Comparative <br> Capability | Can compare performance of different <br> investments | Cannot compare performance of different <br> investments |
| Limitations | Cannot compare returns between <br> different individuals or investment <br> opportunities | Requires determining account value for each cash <br> flow, potentially incurring costs |

## 5. ANNUALIZED RETURN

- Return that would have been earned if a given investment was compounded over a one-year period.
$r_{\text {annual }}=\left(1+r_{\text {period }}\right)^{c}-1$
- Converts short-term returns to an annual basis,
- Standardizes return comparisons across time and investment types.
- Compounded differently based on the period (monthly, quarterly, weekly, daily)
- Limitation: Assumes constant reinvestment at similar rates.
- Returns that would have been earned if an investment was compounded continuously, rather than at discrete intervals.
- For Single Period:
$r_{t, t+1}=\ln (1+$ holding period return) or
$r_{t, t+1}=\ln ($ price relative $)=\ln \left(S_{t+1} / S_{t}\right)$
- For Multiple Period:
$\mathrm{R}_{\mathrm{O}, \mathrm{T}}=\ln \left(\mathrm{S}_{\mathrm{T}} / \mathrm{S}_{0}\right)$
- Continuously compounded returns are always lower than associated holding period returns
- Offers a refined view of returns, especially valuable in financial modeling and analysis.


