# 📘 User Manual: Investment Metrics Explained

## Net Present Value (NPV)

Think of NPV as: “How much is this stream of future profits worth today?”

• NPV > 0 → the investment is profitable

• NPV = 0 → the IRR is the return rate

• NPV < 0 → you’re losing money

📊 Formula: NPV = ∑ CFₜ / (1 + r)ᵗ - Initial Investment

## Internal Rate of Return (IRR)

📌 Definition: Annualized return rate where NPV = 0

📊 Formula: Use numpy or a financial calculator: np.irr([-Initial Investment, CF1, CF2, ...])

## Return on Investment (ROI)

📌 Definition: Total return relative to initial capital.

📊 Formula: ROI = (Total Return / Initial Investment) × 100

ROI includes:

• Appreciation

• Mortgage principal paydown

• Net profit at sale

## Cash-on-Cash Return (CoC)

📌 Definition: Measures the annual pre-tax cash flow relative to the initial cash invested.

📊 Formula: CoC = (Annual Pre-Tax Cash Flow / Initial Cash Invested) × 100

🧮 Example: You put $40,000 down on a rental property and receive $3,600 in annual cash flow:

→ CoC Return = ($3,600 / $40,000) × 100 = 9%

## 🧾 Monthly Expenses

This includes recurring costs like:

• Property Taxes

• Home Insurance

• Maintenance & Repairs

• HOA Fees

• Miscellaneous Operating Costs

💡 Tip: If unsure of monthly expenses, estimate as 25% of rent.

📌 Example: If your rent is $2,000/month, typical expenses might be 25% or ~$500/month.

## Multi-Year Cash Flow & ROI

📊 Formula: Cash Flow = Annual Rent – (Operating Expenses + Mortgage Payments)

📊 ROI = (Total Return / Initial Investment) × 100

✅ What Counts as Cash Flow for CoC and ROI?

→ CoC uses Net Pre-Tax Cash Flow — not total rent.

💡 When CoC = ROI (Year 1): If there is no appreciation, mortgage paydown, or sale value yet, ROI = CoC.

ROI becomes more powerful long-term, factoring in gains like:

• Equity from price appreciation

• Mortgage principal reduction

• Sale value of property

## 📊 Long-Term Metrics

■ IRR (%) – Internal Rate of Return

Definition Recap: IRR is the annualized rate where NPV of all cash flows becomes zero.

📌 Example: You buy a rental with a $40,000 down payment.

Each year you receive $3,600 in cash flow. After 5 years, you sell and receive $60,000 net profit.

→ Python Code:

import numpy as np

irr = np.irr([-40000, 3600, 3600, 3600, 3600, 3600 + 60000])

print(f"IRR: {irr:.2%}") # Result: ~17.7%

■ IRR ≈ 17.7%

## ■ Equity Multiple

📌 Definition: How many times your original investment has grown.

📊 Formula: Equity Multiple = Total Cash Inflows / Total Cash Invested

📌 Example: You invest $40,000 and receive $78,000 total (rent + final sale).

→ Equity Multiple = 78,000 / 40,000 = 1.95×