

Another Discussion on Money-weighted Returns

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Why another discussion on MWR?

There are or at least there is the impression that there are still many people, who ...

... question the value added of calculating and reporting MWR

... question the value added of calculating and reporting MWR for benchmarks

... question the value added of calculating and reporting a MWR attribution

... believe that the methodological problems of IRR cannot be solved

... believe that TWR and MWR are specific methods just for asset management

... believe that TWR and MWR are fundamentally different concepts for calculating returns

Question to answer and hypothesis

- **Question:**

Are TWR and MWR two fundamentally different concepts of return measurement?

- **Hypothesis:**

TWR and the MWR as well as their methodological variations are "only" exceptional cases of a generic concept of return measurement.

Let us start with some history ...

MWR as the original concept of return measurement

- MWR has been used for a very long time in **economics** to measure the profitability of investments.
- MWR puts the profit and loss in relation to the capital invested.

$$\text{Return} = \frac{\text{Profit or loss}}{\text{Capital invested}}$$

- The question to answer defines, firstly, how the profit and loss and the capital invested are concretely defined and, secondly, whether the calculation refers to a historical or a future time period.
- The question to answer defines in addition the underlying assumptions – like compounding, financing and reinvestment – and with this the concrete method for calculating the P&L and the invested capital.

MWR as the original concept of return measurement in asset management

- <https://www.dglegacy.com/history-of-the-asset-management-industry/> (17.05.2023).
 - => "... believe it or not, asset management has been around for thousands of years, in one form or another ..." back to the Romans or Greek.
 - => Commodity trading started in Belgium around the late 13th century and the first formal stock exchange was formed in Amsterdam early in the 1600s.
- Therefore, it can be assumed that the question of how to calculate a return has been discussed since the very beginning and is not one of the second half of the 20th century.
- The publication of "Pension Funds: Measuring Investment Performance" by Peter O. Dietz in 1966 can be seen as a milestone and the beginning of the era of modern return measurement in asset management.

TWR is nowadays the most widely used concept for measuring returns in asset management

- TWR was developed – most probably – due to the need to separate the impact of timing decisions (amount and date of cash flows) from management decisions (like asset allocation or stock selection); as MWR contains both.
- TWR is conceptionally not influenced by the decisions on the invested capital and the amount and date of the cash flows.
- $MWR = TWR + \text{return contribution of timing decisions}$.
- Spreading TWR was pushed by the increasing importance of external asset management.
- TWR is fair from a portfolio manager perspective, quite easy to calculate and allows a comparison with peers.
- MWR faced increasing criticism – also to avoid calculating and reporting two kind of returns to asset management clients.

Criticism of the MWR

- Implicit assumptions like the financing or reinvestment assumption.
- Multiple solutions and sometimes no solution to the mathematical problem.

=> Impression that TWR does not have these kind of "problems" and therefore no implicit financing or reinvestment assumptions.

Financing and reinvestment assumptions of IRR

Formula for the IRR:

$$BMV_0 = \frac{EMV_T}{(1 + IRR)^{Y_T}} - \sum \frac{CI_t}{(1 + IRR)^{Y_{t-0}}} + \sum \frac{CO_t}{(1 + IRR)^{Y_{t-0}}}$$

$$\Rightarrow EMV_T = BMV_0 * (1 + IRR)^{Y_T} + \sum CI_t * (1 + IRR)^{Y_{t-T}} - \sum CO_t * (1 + IRR)^{Y_{t-T}}$$

Financing assumption

Reinvestment assumption

=> The criticism does not focus on the financing or reinvestment assumption, but on the fact that rates should be equal to the IRR.

Financing and reinvestment assumptions of TWR (1/3)

- The financing and reinvestment assumption of the TWR cause the returns of a portfolio with no cash flows and a portfolio with cash flows to be identical under otherwise identical conditions.
- It can be shown that this is exactly the case when the cash flows are compounded with the corresponding **future** TWRs to the end of the measurement period.

Financing and reinvestment assumptions of TWR

(2/3)

$$EMV_{P1} = BMV_{P1} * (1 + TWR_{P1,0-T})^{Y_T}$$

and

$$EMV_{P2} = BMV_{P2} * (1 + TWR_{P2,0-T})^{Y_T} + CI_{P2} * (1 + Sub_TWR_{P2,t-T})^{Y_{t-T}}$$

with

$$BMV_{P2} = BMV_{P1} \text{ and } TWR_{P2,0-T} = TWR_{P1,0-T},$$

$$\Rightarrow EMV_{P2} = EMV_{P1} + CI_{P2} * (1 + Sub_TWR_{P2,t-T})^{Y_{t-T}}$$

Financing and reinvestment assumptions of TWR

(3/3)

=> in general terms:

$$\begin{aligned} EMV_T = & BMV_0 * (1 + TWR_{0-T})^{Y_T} + \sum CI_t * (1 + Sub_TWR_{t-T})^{Y_{t-T}} \\ & - \sum CO_t * (1 + Sub_TWR_{t-T})^{Y_{t-T}} \end{aligned}$$

=> like the IRR, the TWR assumes financing of cash inflows and reinvesting cash outflows – but not with the IRR but with the respective **future** TWRs.

=> in contrast to IRR, TWR answers a different question.

Examples

(1/4)

Table 1: Cash flow stream without interim cash flows

| Date | Beginning market value | Cash flow | Annual TWR | Ending market value | Explicit reinvestment | Explicit borrowing |
|-------------|--|---|--|---------------------|-----------------------|--------------------|
| 31.12.2016 | 1'000.00 | 1'000.00 | | 1'000.00 | | |
| 31.12.2017 | | - | -10.00% | 900.00 | - | - |
| 31.12.2018 | | - | 5.00% | 945.00 | - | - |
| 31.12.2019 | | - | 15.00% | 1'086.75 | - | - |
| | | | | | | |
| Date | Cash flow stream without explicit reinvestment | Cash flow stream with explicit reinvestment IRR | Cash flow stream with explicit reinvestment future TWR | | | |
| 31.12.2016 | -1'000.00 | -1'000.00 | -1'000.00 | | | |
| 31.12.2017 | - | - | - | | | |
| 31.12.2018 | - | - | - | | | |
| 31.12.2019 | 1'086.75 | 1'086.75 | 1'086.75 | | | |
| | | | | | | |
| IRR (annu.) | 2.81% | 2.81% | 2.81% | | | |
| TWR (annu.) | 2.81% | | | | | |

Examples

(2/4)

Table 2: Cash flow stream with interim cash outflows

| Date | Beginning market value | Cash flow | Annual TWR | Ending market value | Explicit reinvestment | Explicit borrowing |
|-------------|--|---|--|---------------------|-----------------------|--------------------|
| 31.12.2016 | 1'000.00 | 1'000.00 | | 1'000.00 | | |
| 31.12.2017 | | -100.00 | -10.00% | 800.00 | 100.00 | - |
| 31.12.2018 | | -200.00 | 5.00% | 640.00 | 200.00 | - |
| 31.12.2019 | | - | 15.00% | 736.00 | - | - |
| Date | Cash flow stream without explicit reinvestment | Cash flow stream with explicit reinvestment IRR | Cash flow stream with explicit reinvestment future TWR | | | |
| 31.12.2016 | -1'000.00 | -1'000.00 | -1'000.00 | | | |
| 31.12.2017 | 100.00 | - | - | | | |
| 31.12.2018 | 200.00 | - | - | | | |
| 31.12.2019 | 736.00 | 1'041.47 | 1'086.75 | | | |
| IRR (annu.) | 1.36% | 1.36% | 2.81% | | | |
| TWR (annu.) | 2.81% | | | | | |

Examples

(3/4)

Table 3: Cash flow stream with interim cash inflows

| Date | Beginning market value | Cash flow | Annual TWR | Ending market value | Explicit reinvestment | Explicit borrowing |
|-------------|--|---|--|---------------------|-----------------------|--------------------|
| 31.12.2016 | 1'000.00 | 1'000.00 | | 1'000.00 | | |
| 31.12.2017 | | 100.00 | -10.00% | 1'000.00 | - | 100.00 |
| 31.12.2018 | | 200.00 | 5.00% | 1'250.00 | - | 200.00 |
| 31.12.2019 | | - | 15.00% | 1'437.50 | - | - |
| | | | | | | |
| Date | Cash flow stream without explicit reinvestment | Cash flow stream with explicit reinvestment IRR | Cash flow stream with explicit reinvestment future TWR | | | |
| 31.12.2016 | -1'000.00 | -1'000.00 | -1'000.00 | | | |
| 31.12.2017 | -100.00 | - | - | | | |
| 31.12.2018 | -200.00 | - | - | | | |
| 31.12.2019 | 1'437.50 | 1'121.73 | 1'086.75 | | | |
| | | | | | | |
| IRR (annu.) | 3.90% | 3.90% | 2.81% | | | |
| TWR (annu.) | 2.81% | | | | | |

Examples

(4/4)

Table 4: Cash flow stream with interim cash inflows and outflows

| Date | Beginning market value | Cash flow | Annual TWR | Ending market value | Explicit reinvestment | Explicit borrowing |
|-------------|--|---|--|---------------------|-----------------------|--------------------|
| 31.12.2016 | 1'000.00 | 1'000.00 | | 1'000.00 | | |
| 31.12.2017 | | -100.00 | -10.00% | 800.00 | 100.00 | - |
| 31.12.2018 | | 200.00 | 5.00% | 1'040.00 | - | 200.00 |
| 31.12.2019 | | - | 15.00% | 1'196.00 | - | - |
| | | | | | | |
| Date | Cash flow stream without explicit reinvestment | Cash flow stream with explicit reinvestment IRR | Cash flow stream with explicit reinvestment future TWR | | | |
| 31.12.2016 | -1'000.00 | -1'000.00 | -1'000.00 | | | |
| 31.12.2017 | 100.00 | - | - | | | |
| 31.12.2018 | -200.00 | - | - | | | |
| 31.12.2019 | 1'196.00 | 1'096.10 | 1'086.75 | | | |
| | | | | | | |
| IRR (annu.) | 3.11% | 3.11% | 2.81% | | | |
| TWR (annu.) | 2.81% | | | | | |

Conclusion

- IRR is the average rate of return assuming that all cash inflows are financed, and all cash outflows are reinvested with the IRR.
- TWR is the average rate of return assuming that all cash inflows are financed, and all cash outflows are reinvested with the respective **future** TWRs.
- TWR is a specific case of the MWR – where in contrast to the MWR the cash flow stream does not impact the average rate of return over the total measurement period.

=> TWR and MWR are not two fundamentally different concepts of return measurement.

=> TWR and MWR are "only" exceptional cases of a generic concept of return measurement.

=> TWR and MWR do answer different questions.

Is this the end of the discussion ?

For sure not ...

Contact details and disclaimer

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