Wealth Management
Dominion Securities

Time-weighted vs. money-weighted rates of return

Understanding the differences

While there are a number of ways to calculate an investment rate of return, the time-weighted rate of return calculation is the more common method used in the investment industry, over the money-weighted calculation method. Both are valid and acceptable calculation methods, but each has different uses and can be appropriate in different circumstances.

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Introduction

Most Canadian investors will receive new annual investment performance reports in early 2017. Canadian investment industry regulators have requested that all reports show account performance using a money-weighted rate of return calculation method. This is a different way of calculating investment account returns versus the more commonly used time-weighted rate of return calculation method.

Time-weighted

The time-weighted calculation is the financial industry and RBC Dominion Securities standard method to measure performance. For example, the methods most commonly used to calculate the performance of financial market indices and mutual funds are types of time-weighted calculation methods.

A quick summary

- The timing of cash flows that you direct, such as contributions (which includes transfers in-kind) and withdrawals, can affect your portfolio's rate of return
- Time-weighted rate of return calculation **does not include** the effect of these cash flows
- Money-weighted rate of return **includes** the effect of these cash flows
- If there are no cash flows, the two methods will produce the same or very similar rate of return

Time-weighted methods do not take into account the effect of an individual's contributions or withdrawals. This method is useful to calculate the performance of broad market indices or mutual funds because contributions and withdrawals – activities that can impact performance, but are not in the fund manager's control – are not taken into account in this calculation method.

Money-weighted

In contrast to time-weighted, money-weighted calculates the rate of return including the impact of contributions to, or withdrawals from, the portfolio.

For example, if an investor contributes a significant sum into their portfolio just prior to the portfolio's performance rising, intuitively, this is a positive action. Now this larger portfolio benefits more, in dollar terms, from the portfolio's growth than if the contribution had not been made.

Conversely, if the investor withdraws a significant sum from their portfolio just prior to the portfolio's performance rising, intuitively, this is a negative action. Now this smaller portfolio benefits less in dollar terms from the portfolio's growth than if the withdrawal had not been made.

How cash flows affect TWRR and MWRR

Consider this example as a hypothetical scenario:

An investor starts with $2,000,000 at the beginning of Year 1 then makes contributions of $200,000 at the start of each of the next three years. He adds $1,000,000 at the start of the fifth year. In the fifth year, the portfolio value grows by 15%. The investor's experience is summarized in the following table:

Hypothetical investor experience

Date	Performance	Contribution amount†	End-of-year market value	Annual gain/loss
Year 1	5.0%	$2,000,000	$2,100,000	$100,000
Year 2	1.0%	$200,000	$2,323,000	$23,000
Year 3	6.0%	$200,000	$2,674,380	$151,380
Year 4	-10.0%	$200,000	$2,586,942	$(287,438)
Year 5	15.0%	$1,000,000	$4,124,983	$538,041

†Contribution at the beginning of the year

The sizeable contribution at the beginning of year five adds a substantial amount of capital to the account just before a relatively high performance period of 15%. Since the higher growth rate takes place on a larger capital base, intuitively this is positive action for the portfolio and the money-weighted rate of return calculation, which takes into account the effect of contributions on the portfolio, will be higher than the time-weighted rate of return calculation.

The MWRR in this example is 3.84%, while the TWRR is 3.07%. Refer to the equations on the following page to see how these are calculated.

How are these returns calculated and what accounts for the difference?

The difference is the treatment of cash flows

TWRR – Cash flows, either as contributions, redemptions or distributions, mark the beginning of a new period. In the example provided, there is only one cash flow event at the beginning of each year, so the sub-period is an entire year. However, multiple sub-periods within a year or within a quarter are possible. Returns for each sub-period are given equal weighting and all sub-periods are linked together to determine the TWRR for the time period.

As TWRR equally weights performance over all periods of time, the cash flow decisions made by the investor, such as the timing and size of contributions or redemptions, are not factored into the results.

In this case, since the sub-periods are already in years, they just need to be linked together and annualized to determine the TWRR. The higher gain achieved in year five just after a sizable contribution doesn't influence the calculation of the TWRR as positively (as it does with the MWRR) calculation since each sub-period is equally weighted. This last sub-period still only accounts for 20% of the return calculation.

TWRR Equation

$$\begin{aligned} \text{TWRR} &= \left((1+\text{return}_1)\times(1+\text{return}_2)\times(1+\text{return}_3)\times(1+\text{return}_4)\times(1+\text{return}_5)\right)^{1/5} - 1 \\ &= \left((1.05)\times(1.01)\times(1.06)\times(0.90)\times(1.15)\right)^{1/5} - 1 \\ &= 3.07\% \end{aligned}$$

MWRR – This method differs from TWRR in that the calculation can be impacted by the timing and size of cash flows, as well as the account's performance over time.

To calculate MWRR, the present value of all cash flows and the terminal value must equal zero. The rate of return that makes this true is the MWRR.

The formula below illustrates this:
MWRR is the rate of return where present value of outflows + present value of inflows = 0

In this case, a large contribution was made just before a relatively higher return in the fifth year. The size of this gain affects the MWRR positively as compared to the TWRR calculation, resulting in a higher MWRR compared to TWRR.

MWRR Equation

$$\text{Initial Cash Flow} + \frac{(\text{cash flow}_1)}{(1+\text{return})^1} + \frac{(\text{cash flow}_2)}{(1+\text{return})^2} \cdots + \cdots \frac{(\text{cash flow}_N)}{(1+\text{return})^n} = 0$$

$$-2{,}000{,}000 + \frac{(-200{,}000)}{(1+\text{return})^1} + \frac{(-200{,}000)}{(1+\text{return})^2} + \frac{(-200{,}000)}{(1+\text{return})^3} + \frac{(-1{,}000{,}000)}{(1+\text{return})^4} + \frac{(4{,}124{,}983)}{(1+\text{return})^5} = 0$$

MWRR = 3.84% (i.e. The rate of return that produces a zero value is 3.84%.)

The above equations are based on the hypothetical example from the previous page.

Summary: Comparison of TWRR and MWRR

Both TWRR and MWRR are valid measures of investment performance. The key differences and primary uses of each are outlined below.

	TWRR	MWRR
Cash flows	Are not factored into returns	Timing and size of cash flows influence returns
What is measured?	Performance of the market value of an investment over a specific time period	The performance of the investment and the impact of client cash flow decisions
Used to gauge	Investment manager's decision making and performance	Client's individual performance

If you have any questions about how your portfolio's rate of return is calculated, or about the performance of your account, please contact me to discuss.