NextCapital Account Return Calculation

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Our goal is to provide the most intuitive and useful personal rate of return information for any chosen time span for the individual's entire account or any sub-group of long or short positions that could start and reverse positions through intraday trading.

The popular methods to find return fail to provide answers for edge cases that commonly occur in personal portfolios for active investors. To find a solution, we evaluated several methods and their derivatives for calculating the personal rate of return.

We found the most consistent method to be what we call "Geometrically Linked Daily Return on Gross Exposure." This is a type of True Time Weighted Rate of Return that we have designed to take into consideration all of your transactions, including dividends and fees.

1   Time Weighted Rate of Return

A time weighted return (TWR) is a form of total return that measures the performance of a dollar invested in a financial asset over the complete measurement period. The TWR only takes into account the Beginning Market Value (BMV) and the Ending Market Value (EMV) of the asset. The formula for calculating the one-period TWR is:

$$R_{TW} = \frac{(EMV - BMV)}{BMV} \tag{1}$$

1.1   Example

Let's assume a portfolio is made up of 5 shares of AAPL purchased on November 3, 2008. At purchase, the shares are valued at $106.98 for a total portfolio starting value of $534.90 (BMV). If those shares were sold on December 31, 2008, the ending market value (EMV) of the portfolio would be 5 shares · $86.54/share = $432.70. The time weighted return would therefore be:

$$R_{TW} = \frac{(\$432.70 - \$534.90)}{\$534.9} = -19.11\%\Delta \tag{2}$$

In practice, portfolios are valued at the time of large cash flows and their time weighted returns are geometrically linked to describe the time weighted return over multiple periods.

2   Geometrically Linked Daily Return on Gross Exposure

We define Gross Exposure to be the total of the "longs" and "shorts" exposure. The significance of gross exposure is that it approximates the total dollars at play and the absolute level of the investment bet.   Our method of calculation uses a True Time Weighted Rate of Return at the position level and then uses the Gross Exposure of the positions to approximate the total return for

an account. Cash flows generated by a position (dividends, commissions, etc) are taken into consideration when summing the gross exposures. Consider the following example:

2.1   Example

Position	Time	Price	Quantity	Cash Flow
ABC - Buy	10:00AM	100	1	-100
BCD - Short Sell	10:01AM	80	-1	80
ABC - Sell	2:00PM	120	-1	120
BCD - Buy to Cover	2:01PM	90	1	-90

The returns for the individual positions can be found using the traditional Time Weighted Rate of Return method.

$$R_{TW\,ABC} = \frac{(\$120 - \$100)}{\$100} = 20\%$$

$$R_{TW\,BCD} = \frac{(-\$90 + \$80)}{\$80} = -12.5\%$$

The return for the entire portfolio can be calculated by using the gross exposure, represented here by the entry cash flows for the account and the exit cash flows for the account.

Entry Cash Flows $= -\$100 - \$90 = -\$190$

Exit Cash Flows $= \$80 + \$120 = \$200$

$$\text{Total Return} = \frac{(Exit\,Flows - Entry\,Flows)}{Entry\,Flows} = \frac{(\$200 - \$190)}{\$190} = 5.26\%$$

The above example is for one day. To get the return over an arbitrary time frame we calculate the returns over each day. The return over multiple days are then geometrically linked together to give us the final result. For instance, to get the total return over a span of two days we can use the previously calculated daily returns and link them together.

$$R_{12} = ((1 + R_1) * (1 + R_2) - 1)$$