

## Stock Market Perspective: Rate of Return Calculations

When evaluating a potential investment or seeing how one's own portfolio has done, one measure that is always wanted is the rate of return. For a mutual fund with distributions reinvested, this is fairly straightforward since it can be calculated directly from the price of the fund adjusted for distributions at the beginning and the end of a period. Distribution adjusted prices are available from several sources such as [finance.yahoo.com](http://finance.yahoo.com).

Allocation	60%	40%		Portfolio	Cash
	VFINX	VUSTX	Total	Return	Flow
2007					
Value at start	\$ 6,000	\$ 4,000	\$ 10,000		
Performance	5.39%	9.24%			
EOY Value	\$ 6,323	\$ 4,370	\$ 10,693	6.93%	\$ 3,000
2008					
Value at start	\$ 8,216	\$ 5,477	\$ 13,693		
Performance	-37.02%	22.52%			
EOY Value	\$ 5,174	\$ 6,711	\$ 11,885	-13.20%	\$ (3,000)
2009					
Value at start	\$ 5,331	\$ 3,554	\$ 8,885		
Performance	26.49%	12.05%			
EOY Value	\$ 6,743	\$ 3,982	\$ 10,725	20.71%	
3-year Compounded Annual Returns					
	-5.66%	14.46%	2.36%		

If one has a brokerage or mutual fund account which has not had any deposits or withdrawals, the same calculation can be done by comparing the current value of the account with initial (and only) deposit. Complications occur when there are cash flows—additional deposits or withdrawals during the period being considered. There are several ways the rate of return can be computed. Two of them are the most common and likely the best ones for evaluating investment performance. Those calculation methods are called *time-weighted* and *money-weighted*. The latter is sometimes also called the internal rate of return (IRR).

The table illustrates these calculations in a simplified contrived example of a not very savvy investor. He wants to have a portfolio of 60% in stocks and 40% in bonds, rebalanced annually.

He chooses to use the Vanguard Index 500 fund (ticker symbol VFINX) for stocks and the Vanguard Long-Term Treasury fund (VUSTX)<sup>1</sup> as his portfolio, and buys the two funds with \$10,000 on the last day of 2006. Because the portfolio gains in 2007, at the end of the year he is optimistic so he adds \$3,000 and rebalances. 2008 is a bad year for the portfolio because the drop in the stock fund is more than the healthy gain in the bond funds. Being discouraged, he withdraws \$3,000 and rebalances. The table shows how this would have worked through the end of 2009.

At the bottom are the three-year compounded rates of return for the two funds, which account for reinvested dividends, and the rate for the portfolio. The portfolio return, 2.36% is the normal rate of return calculation ignoring the cash flows: the cube root (since three years) of the ending value divided by the initial value

minus one<sup>2</sup>.

However, there were two cash flows, and that calculation does not take them into account. That is where the time-weighted and money-weighted methods come into play. The time-weighted method factors out the cash flows. If this were an account managed by someone like me, it is the proper calculation to evaluate the manager's effectiveness. It does not penalize or reward the advisor for the bad or good timing of the client's investments and withdrawals. The money-weighted calculation takes both the amounts and timing of the cash flows into account and finds a value that would be a valid

<sup>1</sup> Although these are excellent choices due to Vanguard's low expenses, you should not consider the use in the example as a recommendation to own or not own these or any other Vanguard fund.

<sup>2</sup> The Excel formula is  $= (10725/10000)^{(1/3)} - 1$

comparison to other investments with cash flows over the period.

The time-weighted calculation is the simpler of the two. It is based on the annual portfolio returns shown in the second column from the right: the cube root of (1.0693)(.8680)(1.2071) minus 1. The numbers in the parenthesis are one plus the percent returns expressed as decimals. The calculation returns 3.86%.

Unfortunately, there is no direct formula for the money-weighted return or IRR. It is computed by trial-and-error to find the return that balances out the cash flows including the initial and final values. Fortunately, Excel and other spreadsheets have an IRR function. For the table in the example, it returns 0.71%. That value is lower than the time-weighted one, which shows the unfortunate timing by the investor.

Note that compound rate of return for the portfolio, 2.36% is different from, and in between the time-weighted and money-weighted values. While it is affected by the cash flows, it does not take their timing into account. The money-weighted calculation does that while the time-weighted one factors out their effects.

► **What rate(s) are on your reports?** I send quarterly reports to clients showing the performance of their accounts in the past quarter, the year to date, and since inception. The typical client has added funds (yea!) and/or

withdrawn funds (usually to meet required distributions from IRA accounts, so no boo) to the accounts I manage. I show the time-weighted returns on the reports since those reflect my management.

(If you would like to see your money-weighted return since inception, please ask. I have the data, so setting up the IRR calculation in Excel would not be hard.)

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*The good ways to compute rates of return on accounts that have cash flows are time-weighted and money-weighted (IRR).*

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A minor consideration is the effect on the returns shown of my management fees, which are paid quarterly. For those

who have the fee deducted from your accounts, the calculations are the true time weighted returns. That is because fees deducted from accounts are not cash flows; they just reduce the value of the holdings. For those who pay the fees from an external account<sup>3</sup> the returns shown on the reports are a little too high because each fee payment is in effect a deposit into the account. Taking those into account would be cumbersome due to their frequency. However, as a “back of the envelope” calculation, you can subtract the annual fee rate from annualized return since inception. The appropriate fraction could be subtracted from quarterly and year-to-date returns. That procedure won’t be exact, but will be close enough to provide a fair picture.

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<sup>3</sup> There can be tax advantages to doing so for some, and for others it may be more advantageous to have the fees deducted from their accounts. Like most everything with taxes, things are not simple.