

Annualizing Daily Returns – A Twist and a Solution

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Abstract

Annualizing daily returns poses a couple of problems to institutional investors, investment managers and custodians. The issue at hand is that the number of days in a year are not only variable, but data can be provided on either a calendar year or a business day basis further compounding the problem. This note proposes a simple variation that needs to be made to ensure consistency in performance measurement by industry participants.

Introduction

The investment management industry has gradually drifted towards examining annualized returns over long data histories as a key summary statistic to evaluate the performance of either an investment manager, mutual fund, or asset class. Those well versed in performance measurement have come to terms with basic equations to take long series of data and distil them into annualized returns. In short, the annualized return A is defined as

$$A = \{\Pi(1+r_i)\}^{T/t}$$

Where t is the number of observations (either on a daily, monthly or even quarterly basis), T is the factor for converting the observations to annual (e.g., 12 for converting monthly to annual), Π is the product function over the entire history (t), and r_i is the periodic return of the manager or the asset class. In effect, $\{\Pi(1+r_i)\}$ is the cumulative return and T/t is the factor that annualizes the cumulative return. For example, for a manager with a 3-year record with monthly data, $t = 36$ and $T = 12$, and hence the annualization requires taking the 1/3 root or the cube root of the cumulative return.

Using this equation for monthly (quarterly and annual) data is trivial because there are only 12 months (4 quarters and 1 year) in every year and these values are static. However, for daily data, and to some extent even for weekly data, this equation gets a bit convoluted. We ignore weekly data only because it is not as commonly used as daily data, but the recommended correction may be applied here as well.

The Problem

Many institutional clients use EXCEL-based models to evaluate manager performance or tactical asset allocation rules. There are two basic problems with using daily data. For those who calculate performance over the calendar year, there can be either 365 days or 366 days in a year, making T an uncertain factor. For those who look at performance over the number of business days, once again T is variable and can range generally from a maximum of 260 days (in currency markets where a rate is quoted every weekday with the exception on New Years day) to approximately 250 days (in markets where no prices are quoted on holidays and there are generally 10 holidays in the United States, but possibly more in other countries). As is evident, with T being variable, there can be no consistency or even accuracy in the calculations. For example, the industry standard could be to treat the number of business days as 250, which could create an error if over a 3 year cycle there are 748 days or 752 business days. For example, on a strategy we tested with a 28.27% cumulative return over 758 days, the annualized return rises from 8.56% using 250 days in a year to 8.92% using 260 days in a year. This is not a trivial adjustment that can be off by a basis point or two! This is not a problem with monthly data as T is constant at 12 (or quarterly).

A separate question is why are business days important? Many data vendors only provide data on indices on a business day basis and this becomes important when investors are

testing the historical performance of a manager, asset class or trading strategy across assets or managers. As a result, clients are forced to use the data that they get from the data vendors and have to adjust their analyses accordingly. Further, very many performance systems make some generic assumptions about number of days in a year and most clients are not even aware of these assumptions underlying models or their potential impact on performance calculations. Where trades have to meet certain thresholds, an error of this magnitude can easily lead to acceptance of rules/managers that may not be as good as others.

The Simple Solution

Given that all annualized calculations of daily performance will suffer from this problem, we propose a trivial adjustment that performance calculations must make. We suggest that daily return series be converted into a monthly return series and this is a trivial calculation. There are two ways to do this: (i) sum up the daily returns in a month; and (ii) calculate the monthly returns based on the cumulative value at the start of the month and the end of the month. Thereafter, use the monthly series to first create a cumulative series and then calculate the annualized return assuming 12 months in a year (T) and the number of months in the underlying data series (t). In the case of the previous set of returns, a 28.27% cumulative return over 3 years, translates into an annualized return of 8.65%.

Remaining Challenges

The issue that is still difficult to manage is what is done if evaluations start mid-month (or mid-week). In such situations, one possibility is to use the fraction of the month for the annualization calculations. For example, if the evaluation starts on the 15th of a month that has 30 days, then this can be seen as 0.5 months and included in the calculations. However, there will be additional management of this calculation if the start and end dates are mid month.

Conclusions

Investors often consider annualized returns for their evaluations of strategies, managers and asset classes and these annualized calculation could be wrong if calculated on daily (or weekly) data. This follows because the number of days in a year (calendar or business) is variable. This note proposes a simple adjustment that rolls up daily data into monthly data and then performs the annualization using monthly data. The latter strategy is always consistent as the number of months in a year is fixed.

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