

## 1. Calculation of Beta and Alpha

### What is Beta?

Beta is another popular measure of the risk of a stock or a stock portfolio. For Stock-Trak's purposes, we will only calculate Beta of the stocks (US and some intl) in the open positions.

The Beta's of individual stocks in the portfolio add up according to their weights to create the portfolio beta.

### Calculation of Beta

There are two things that are used in the Portfolio Beta calculation:

1. The weight of the individual stock in the portfolio
2. The beta of the individual stock in the portfolio

The weight of the individual stock is calculated as follows (please note that a short position counts as a negative MV of Stock value):

### Putting it together

Beta (portfolio) = [Weight (Stock A) X Beta (Stock A)] + [Weight (Stock B) X Beta (Stock B)] + ... + [Weight (Stock n) X Beta (Stock n)]

### Example of Beta Calculation – with just longs

Portfolio Value = \$120,000

Market Value of Google in Open Positions: \$40,000

Beta of Apple 1.22

Market Value of Apple in Open Positions: \$30,000

Beta of Google: 1.13

- Weight of Apple:  $\$40,000 / \$120,000 = 0.333$
- Weight of Google:  $\$30,000 / \$120,000 = 0.25$

Portfolio Beta = [Weight of Apple X Beta of Apple] + [Weight of Google X Beta of Google]

$$\Rightarrow [0.333 \times 1.22] + [0.25 \times 1.13]$$

$$\Rightarrow 0.40626 + 0.2825$$

$$\Rightarrow \mathbf{0.68876}$$

### Example of Beta Calculation – with long and shorts

Portfolio Value = \$120,000

Market Value of Google in Open Positions: \$40,000

Beta of Apple 1.22

Market Value of Apple in Open Positions (Short): **-\$30,000**

Beta of Google: 1.13

Weight of Apple:  $\$40,000 / \$120,000 = 0.333$

Weight of Google:  $\mathbf{-\$30,000 / \$120,000 = -0.25}$

Portfolio Beta = [Weight of Apple X Beta of Apple] + [Weight of Google X Beta of Google]

$$\Rightarrow [0.333 \times 1.22] + [\mathbf{-0.25} \times 1.13]$$

$$\Rightarrow 0.40626 - \mathbf{0.2825}$$

$$\Rightarrow \mathbf{0.12376}$$

### What is Alpha?

Alpha is the excess return that the portfolio generated over what was expected.

### Calculation of Alpha

It has two parts to its calculation:

1. The Actual Return of all stocks in the open position
2. The return expected of the stocks in the open position

The EXPECTED return of the Stocks in the Open Positions is calculated as:

(No. of days since Portfolio Start / 365 \* Interest Rate Earned on Cash) + Beta of Portfolio \* [Benchmark % Return – (No. of days since Portfolio Start / 365 \* Interest Rate Earned on Cash)]

## Example of Alpha:

Initial Cash: \$100,000

Interest Rate Earned on Cash: 3%

Interest on Cash to date: \$175

Loan Interest: \$50

Open Position Profit/ Loss:

    Google: \$3,000

    Apple: **-\$2,000**

Total Open Position Profit/ **Loss**: \$1,000

Beta of Portfolio: 0.12376

No. of Days since Portfolio Start: 50

Return on Benchmark Index: 2%

Actual Return:  $(\$1,000 + \$175 - \$50) / \$100,000 \Rightarrow 1.125\%$

Expected Return:  $(50/365 * 3\%) + 0.12376 * [2\% - (50/365 * 3\%)] \Rightarrow 0.6\%$

**Alpha of Portfolio = 1.125% - 0.6% = 0.525%**