



## FTS Real Time Project: Understanding Beta

### Question: What is beta and how is it used?

Beta measures the sensitivity of a stock to the market as a whole. Intuitively, when the stocks generally move up in prices, a stock with beta greater than 1 tends to move up by more than the average stock, while a low beta stock tends to move up by less. So a high beta stock is more sensitive to overall market movements, and therefore more volatility. Technically, beta is the covariance of a stocks return with the overall market, and we use an index, such as the S&P500 index, as a proxy for the market as a whole.

Estimates of betas for stocks are readily available; most financial data sites, like Yahoo Finance, provide such estimates. The FTS Real Time Client also has estimates of beta, and provides links to various sites with estimates. You can also estimate beta yourself by running a regression.

In this project, you will assess whether beta measures risk and how to use it to control the risk of your portfolio. The portfolio beta is calculated as follows. We start with a concept of a portfolio weight. It measures the proportion of your investment in a stock. For example, suppose you have two stocks in your portfolio, your position stock 1 is worth \$1,000 and that in stock 2 is worth \$3,000. Then, your total investment is worth \$5,000, the proportion in stock 1 is 25% and the proportion in stock 2 is 75%. Let  $w_i$  denote the portfolio weight of stock  $i$ . In the example,  $w_1 = 0.25$  and  $w_2 = 0.75$ . Let  $\beta_i$  denote the beta of stock  $i$ . The portfolio beta is the weighted average of the stock beta's:

$$\beta_p = \sum_i w_i \beta_i$$

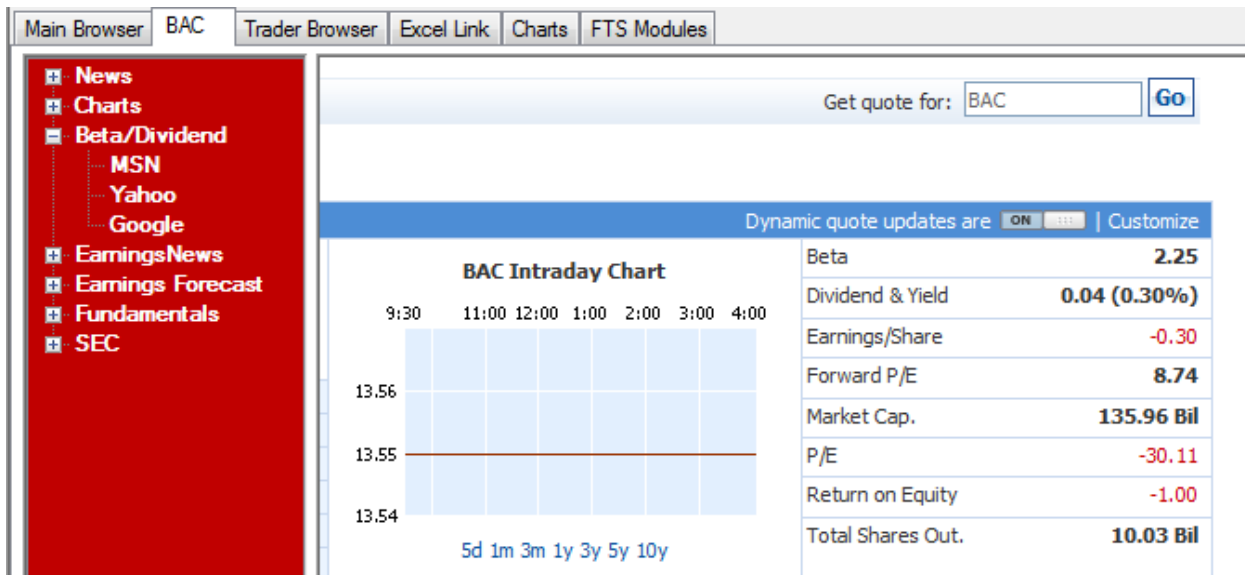
The portfolio beta measures the sensitivity of your portfolio to the overall market. You can see that if you invest in some high beta stocks and some low beta stocks, you can control the risk of your portfolio.

In the FTS Real Time Client, you can see individual stock betas and your portfolio beta in the Index Model analytic. This analytic also has performance measures and other information; these are explained elsewhere:

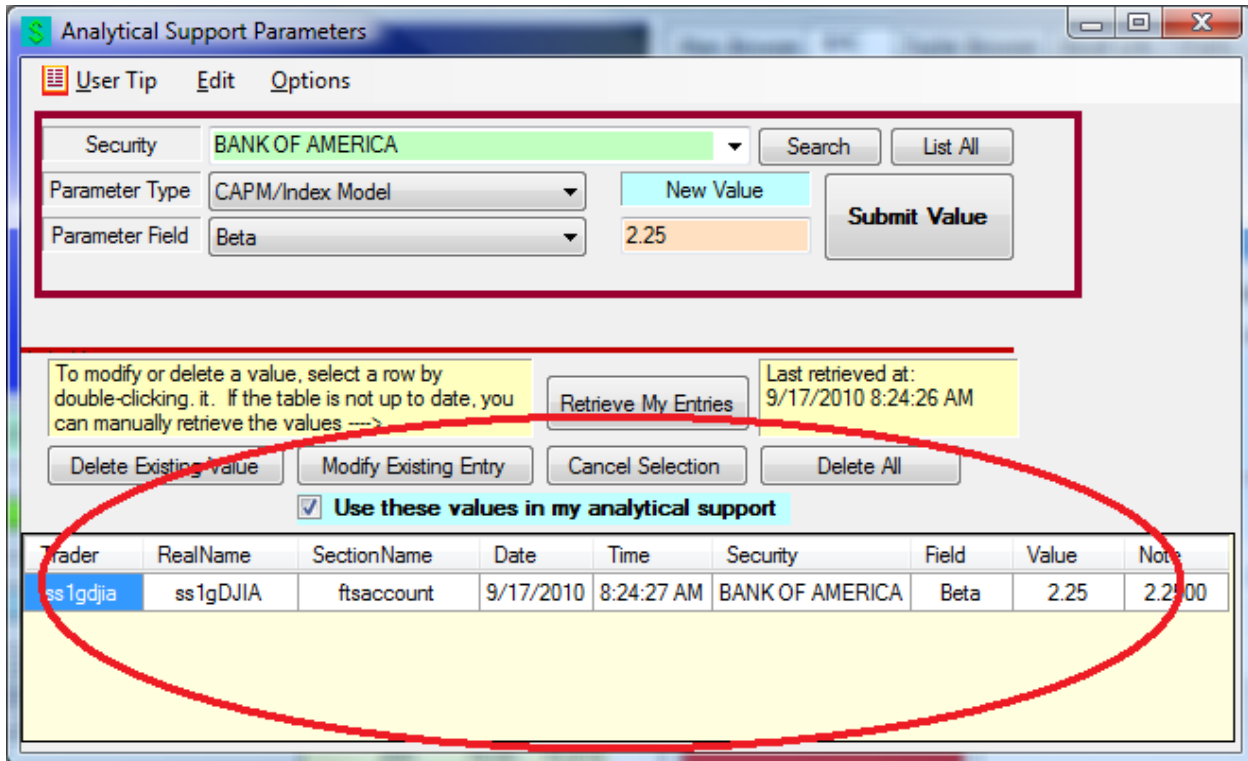
		Value	Beta	Exp Return	Volatility	Sharpe	Treynor	Jensen	M2
<b>Overall Position</b>		98,146.00	0.9803	0.0813	0.2799	0.1503	0.0429	0.0000	0.0821
Weight (SS)			1.5348	0.1051	0.4379	0.1504	0.0429	0.0000	0.0821
Weight* (no SS)			1.5348	0.1051	0.4379	0.1504	0.0429	0.0000	0.0821
Eq Weighted			1.0183	0.0829	0.2912	0.1500	0.0429	0.0000	0.0820
Benchmark			1.0000	0.0821	0.2853	0.1504	0.0429	0.0000	0.0821
<b>Position (Raw)</b>			0.9803	0.0813	0.2799	0.1503	0.0429	0.0000	0.0821
Name	Benchmark	Value	Beta	Risk Free Rate	Equity Premium	Exp Return	Volatility	Weight	Raw Weight
AT&T	S&P 500 INDEX	0.00	0.6600	0.0392	0.0429	0.0675	0.1436	0.0000	0.0000
BANK OF AMERICA	S&P 500 INDEX	2,710.00	2.4500	0.0392	0.0429	0.1443	0.4131	0.0276	0.0276
BOEING	S&P 500 INDEX	0.00	1.3100	0.0392	0.0429	0.0954	0.3070	0.0000	0.0000
CATERPILLAR	S&P 500 INDEX	7,200.00	1.8200	0.0392	0.0429	0.1173	0.2918	0.0734	0.0734
CHEVRON	S&P 500 INDEX	15,810.00	0.6900	0.0392	0.0429	0.0688	0.1944	0.1611	0.1611
CISCO SYSTEMS	S&P 500 INDEX	0.00	1.2400	0.0392	0.0429	0.0924	0.4451	0.0000	0.0000
COCA-COLA	S&P 500 INDEX	0.00	0.6200	0.0392	0.0429	0.0658	0.1424	0.0000	0.0000
E.I DU PONT DE NEMOURS	S&P 500 INDEX	0.00	1.4900	0.0392	0.0429	0.1032	0.2904	0.0000	0.0000
EXXONMOBIL	S&P 500 INDEX	6,097.00	0.4000	0.0392	0.0429	0.0564	0.2041	0.0621	0.0621

The portfolio beta is at the top, the individual betas are below. The beta's are calculated relative to the benchmark index, which here you can see is the S&P500. The weights are also shown, but in two ways: "Weight" and "Raw Weight." These differ when you have short sold a stock; the difference is explained in the Portfolio Diversification exercise; they will be the same in this exercise.

Estimates of beta from different financial sites are in the information support area. Double click on a stock name in the Ticker Window or an analytic display, and you will see the information at the top right, for example:



This is what was reported by MSN Money for Bank of America (symbol BAC) when this exercise was written. You can see that the estimate of beta in the FTS Real Time Client for BAC is 2.45. You can override this estimate of beta as follows. Click on "Parameters" (either within the Analytics area or the menu at the top):



We selected Bank of America as the Security, the parameter type (beta) belongs to the Index Model analytic, and the parameter “field” name is Beta. We entered 2.25 as the new value, and clicked Submit Value. The result of the submission is shown below. We then checked “Use these values in my analytical support” to change the value of beta for Bank of America:

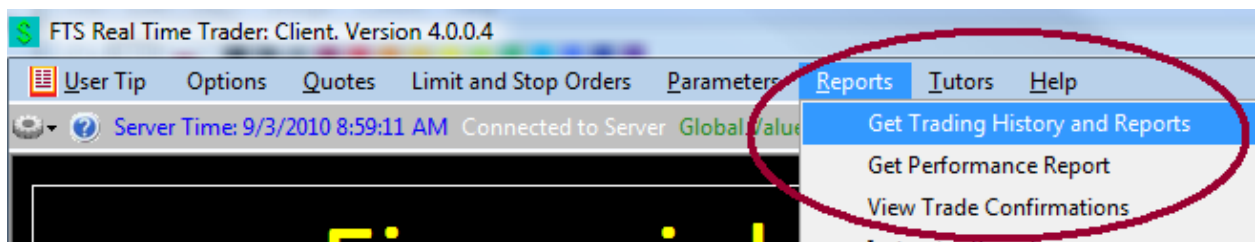
The screenshot shows a financial trading system interface with a table of parameters. The 'Beta' column is highlighted in red. The 'Overall Position' row shows a Beta of 0.9747. The 'BANK OF AMERICA' row shows a Beta of 2.2500.

		Value	Beta	Exp Return	Volatility	Sharpe	Treynor	Je
Overall Position		98,146.00	0.9747	0.0810	0.2783	0.1503	0.0429	0.
Weight* (SS)			1.5059	0.1038	0.4296	0.1504	0.0429	0.
Weight* (no SS)			1.5059	0.1038	0.4296	0.1504	0.0429	0.
Eq Weighted			1.0117	0.0826	0.2893	0.1500	0.0429	0.
Benchmark			1.0000	0.0821	0.2853	0.1504	0.0429	0.
Position (Raw)			0.9747	0.0810	0.2783	0.1503	0.0429	0.
Name	Benchmark	Value	Beta	Risk Free Rate	Equity Premium	Exp Return	Volatility	W
AT&T	S&P 500 INDEX	0.00	0.6600	0.0392	0.0429	0.0675	0.1436	0.
BANK OF AMERICA	S&P 500 INDEX	2,710.00	2.2500	0.0392	0.0429	0.1358	0.4131	0.
BOEING	S&P 500 INDEX	0.00	1.3100	0.0392	0.0429	0.0954	0.3070	0.
CATERPILLAR	S&P 500 INDEX	7,200.00	1.0200	0.0392	0.0429	0.1173	0.2918	0.
CHEVRON	S&P 500 INDEX	15,810.00	0.6900	0.0392	0.0429	0.0688	0.1944	0.
CISCO SYSTEMS	S&P 500 INDEX	0.00	1.2400	0.0392	0.0429	0.0924	0.4451	0.
COCA-COLA	S&P 500 INDEX	0.00	0.6200	0.0392	0.0429	0.0658	0.1424	0.
E.I DU PONT DE NEMOURS	S&P 500 INDEX	0.00	1.4900	0.0392	0.0429	0.1032	0.2904	0.
EXXONMOBIL	S&P 500 INDEX	6,097.00	0.4000	0.0392	0.0429	0.0564	0.2041	0.

You can see that the portfolio beta estimates have also been recalculated; since we have lowered the beta estimate, our overall portfolio beta has gone down.

## The Project

1. Select one high beta stock and one low beta stock. You can use either the built in estimates of beta, or if advised by your instructor, use your own estimates of beta.
2. Invest an equal dollar amount in each stock (so the portfolio weight of each stock is 0.5).
3. Over time, as prices change, your weights, and therefore the portfolio beta, will change. Buy and sell stocks appropriately so that the weights remain at 0.5.
4. After 5 days or longer, download the price history of each stock and also your portfolio value. The price history can be downloaded from a site such as Yahoo finance. Sample instructions are in the “Understanding Risk and Return” project. You download the history of your portfolio value from the Reports menu:



- Generate the report “End of Day Market Values” and copy the values, returns, and export the table into Excel:

Trading History

User Tip Edit Options Refresh History

Select Report: End of Day Market Values

Generate Report

Export Table to Excel

Last retrieved at: 9/6/2010 7:39:50 AM

Table Graph

Date	Value	Return	Benchmark	Benchmark Return	Alpha
8/21/2010	1000000		1071.69		
8/22/2010	1,000,004.00	0.00000	1,071.69	0.00000	0.00000
8/23/2010	1,000,008.00	0.00000	1,067.36	-0.00404	0.00404
8/24/2010	1,000,012.00	0.00000	1,051.87	-0.01451	0.01452
8/25/2010	1,000,017.00	0.00000	1,055.33	0.00329	-0.00329
8/26/2010	999,705.30	-0.00031	1,047.22	-0.00768	0.00737
8/27/2010	1,000,806.00	0.00110	1,064.59	0.01659	-0.01549
8/28/2010	1,000,810.00	0.00000	1,064.59	0.00000	0.00000
8/29/2010	1,000,813.00	0.00000	1,064.59	0.00000	0.00000
8/30/2010	999,839.20	-0.00097	1,048.92	-0.01472	0.01375
8/31/2010	999,783.30	-0.00006	1,049.33	0.00039	-0.00045
9/1/2010	1,002,195.00	0.00241	1,080.29	0.02950	-0.02709
9/2/2010	1,002,097.00	-0.00010	1,090.10	0.00908	-0.00918
9/3/2010	1,003,633.00	0.00153	1,104.51	0.01322	-0.01169
9/4/2010	1,003,636.00	0.00000	1,104.51	0.00000	0.00000
9/5/2010	1,003,639.00	0.00000	1,104.51	0.00000	0.00000

5. In Excel, plot the stock returns, the portfolio returns and the benchmark return.
6. Answer the following questions:
  - Was the return of the high beta stock more volatile than the return of the low beta stock?
  - Was the return of the high beta stock more volatile than the return on the benchmark?
  - Was the portfolio return less volatile than the high beta stock?
  - If your portfolio beta was less than 1, was the portfolio beta less volatile than the benchmark?
  - If your portfolio beta was greater than one, was the portfolio return more volatile than the benchmark?