

FTS Real Time Project: “Smart Beta” Investing

Summary

“Smart beta” strategies are a class of investment strategies based on company fundamentals. In this project, you will

- Learn what these strategies are
- Construct and manage your own “smart beta” portfolio
- Compare its performance to a market index.

Overview

“Smart Beta” investing refers to class of strategies that rely on “fundamental weights” (how much you invest in a stock depends on the stocks fundamentals) rather than “value weights” (how much you invest depends on the market value of the stock) in portfolio construction. For background information, we refer you to [this general article](#) by the originators of these strategies, Research Affiliates, and to this [academic paper](#) describing the methodology.

In traditional investing, there are two distinct strategies you can follow. The first is called “passive” and the second is called “active.” A passive strategy says that you should follow a rule and stick to it and not think about what is going to go up or down. The most common passive investing strategy is indexation: buy “an index” (i.e. an exchange traded fund or a mutual fund that mimics an index like the S&P500). Active strategies are exactly what they imply: you decide what to buy and sell based on actively analyzing information. For example, you may forecast future stock prices, use technical analysis or use fundamental analysis to decide what to trade. As you might imagine, there is a lot of debate about whether active portfolio management perform better than passive indexation strategies. If you want to see some actual numbers, consult [SPIVA](#) which evaluates how active strategies compare to the S&P Indexes in performance.

“Smart Beta” strategies fall somewhere in between. They differ from the passive strategy of “buying an index,” or indexation, in an important way. Indexation implies that the dollar amount allocated to a stock is proportional to its market value. So it has a bias against small stocks. In a smart beta strategy, the amount allocated to a stock is based on fundamentals (more on this below). You get to choose the fundamentals (so in that sense it is active) but once you do, the rest is passive: there is an exact formula for what you should buy and sell. You only change the portfolio when fundamentals change, which is not very frequently. However, you can add a bit of active management to this strategy as well as you will see.

In this project, you will learn how to develop and evaluate the performance of a smart beta strategy of your choice against a market index. The evaluation will be based on live “forward test:” you will trade at real time prices going forward in time. Along the way, you will gain a lot of insight into how such strategies are constructed and how they work.

This project uses

- Valuation Tutor and/or the Financial Statement Analysis Module
 - Valuation Tutor and the FSA Module require Windows, and works with emulator such as VMWare (which has academic discounts and lets you run Windows applications on a Mac).
- The FTS Real Time Client
 - This will be used for trading. You can use either the Windows version or the browser-based version. Automatic implementation of a large portfolio, as well as rebalancing a large portfolio, can be done quickly in the Equity Portfolio Rebalancer in the Windows version.

The project requirements are quite simple. You will need an FTS Real Time account for an FTS Stock Case. You can select a subset of stocks to work with or use the entire set. You will have to choose the fundamentals you use. Once you start, you should manage the portfolio for at least a month, longer if possible. At the end, you will write a report explaining what you did and comparing the performance of each portfolio. Note that the goal here is not to “pick stocks.” It is to learn what these strategies are, how they are implemented, and to learn how to evaluate performance.

Background

We start with a concept of a portfolio weight, which is central to all of this. 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 \$4,000, 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 . So in the example, $w_1 = 0.25$ and $w_2 = 0.75$.

Let M_i be the market value of stock i . This is equal to the shares outstanding multiplied by the stock price. Let M be the total market value of all stocks you are considering.

The *market weight* of stock i is $m_i = M_i/M$. This is simply the market value of stock i divided by the market value of all the stocks.

Indexation and Market Weights

In an indexation strategy, the proportion you invest in stock i is m_i . So if your total investment is $\$V$, the dollar amount invested in stock i is $V \cdot m_i$. If p_i is the price of stock i , you should buy Vm_i/p_i shares.

You can see right away that in such a strategy, you will invest the largest amount in the stock with the largest market value. So an indexation strategy favors large stocks. If you looked at the largest 1000 US stocks, you would find that about 200 stocks make up about 70% of the index.

Smart Beta Strategies

These strategies ignore prices and instead weight stocks based on fundamentals. This is also known as “fundamental indexation.” The steps involved are:

- Select a set of fundamentals
- Select a set of stocks
- Weight stocks according to their fundamentals, not price.

Example

Academic research has pointed out various fundamental variables that result in better stock performance, though such studies are always controversial. One such variable is gross profitability (or gross margin) divided by assets (see [this reference](#), for example).

So suppose you want to construct a portfolio based on gross profitability. What would be the portfolio weights?

Let g_1, g_2, \dots, g_N be the gross profitability of companies 1 to N. Let G be the sum of the gross profitability across the companies. Then, the portfolio weight for company 1 is $w_1 = g_1/G$, for company 2 it is $w_2 = g_2/G$. So you get a higher weight if you contribute more to gross profitability.

Now, let’s take a second variable, based on say the accruals anomaly (the [original paper is here](#), you will need permission to access it). The basic idea behind the accruals anomaly is that companies whose earnings have a high proportion of cash (i.e. a low proportion of accruals) outperform companies who don’t.

Suppose we want to use both gross profitability and low accruals to weight our portfolio. Let a_1, a_2, \dots, a_N be our accruals measure for each company, and let A be the total of all companies. Then, the weight of company 1 based on both is the average of g_1/G and a_1/A :

$$w_1 = \frac{1}{2}(g_1/G + a_1/A)$$

Note that the portfolio weights sum up to 1. If we had three variables, we would average over the three variables in the same way.

Smart Beta Indexes and ETF’s

Many financial data companies now have fundamental indexes (paralleling value weighted indexes like the S&P 500). You can also “trade” these indexes through exchange traded funds (ETFs). These indexes are typically based on variables such as sales, dividends, cash flow from operations, and book value of equity, and the weights are calculated based on the averages of these variables over several periods.

Indexes include, among others:

- [The Russell Indexes](#)
- [The FTSE Indexes](#)

ETF’s that track fundamental indexes include, among others:

- [PowerShares ETFs](#)
- [Schwab ETFs](#)

- [Wisdom Tree](#)

Using Price Based Information to Select Stocks

Even though pure smart beta strategies do not use market prices to determine portfolio weights, you can still use price-based information in refining your strategy. This introduces an “active management” component, and is a departure from “pure” smart beta strategies.

Here is an example: suppose your strategy includes gross margin as a fundamental. You could look at the “price of buying gross margin” and select stocks that are “cheap” relative to others.

Suppose stock 1 has a gross margin to price ratio of 2 and another has a gross margin to price ratio of 4 (these numbers are just for illustration, they don’t represent values you may expect to see). The first is more expensive: you only get half as much gross margin per dollar spent as you do for the second. So you may decide to skip the first stock; the second stock represents better value. You may be familiar with this type of stock selection with the price to earnings (P/E) ratio: stocks with a low P/E ratio can be considered “cheap:” it costs less to buy a dollar of earnings.

If you use such price based criteria, you don’t have to buy every stock in the case based on the proportion it contributes to gross margin, you can select a subset based on how much it costs to buy that fundamental. If you want, you can actively monitor the cost of acquiring the fundamentals. For example, suppose the price of the first stock fell and the gross margin to price ratio rose to 5. You may now want to include it in your portfolio. That would require recalculating all the portfolio weights and rebalancing your portfolio.

The Project

The project is fairly straightforward:

- Decide on the fundamentals you want to use
 - For example, dividends or gross margins or sales
- Decide whether you want to use
 - the most recent value of the fundamentals you have selected
 - you can get these from Valuation Tutor for US stocks
 - or an average of the past few years or quarters
 - you can use the FSA module with data from Morningstar or Compustat through WRDS
 - you must download the data through your universities subscription
 - Compustat/WRDS lets you download data on many stocks at once, all you need are the stock tickers
 - With Morningstar, you have to download the data one statement at a time, which is not too hard for 20 to 30 stocks.
 - Morningstar has some data available for download on its web site as well.
- Select a universe of stocks
 - For example, a subset of the FTS 1000 Stock Case or another stock case
 - You can use price based information to narrow down the set of stocks if you like
- Create the weights

- For each fundamental, calculate the proportion of the total made up by each stock
- Then average the proportions across the fundamentals.
- You may want to restrict the number of stocks to say 30 or 50. Otherwise you will end up with a very large portfolio, and will incur transactions costs even if you are only buying small amounts of some stocks.
- Implement the strategy
 - You will need to rebalance periodically because as prices change, your weights will deviate from your target. You will also have to rebalance if fundamentals change.
 - Remember that when you rebalance, you will incur transactions costs. The Equity Portfolio Rebalancer helps you understand the cost of rebalancing and can automatically rebalance your portfolio for you if you want.
- After a period of time (at least a month), compare its performance to the value weighted benchmark, which in the US stock cases is the S&P 500 index.

Example: Using Valuation Tutor

We now show you how to create the indexation weights.

- Valuation Tutor is simple to use; it has the latest data on up to 1000 US companies.
- The FSA module is more general, but you have to download your own data. It can analyze hundreds of companies, over multiple time periods, handle quarterly and annual data, produce statistics such as averages and growth rates, and it also lets you screen companies on various dimensions.
- You will have to use the FSA module if you are using a non-US stock case.

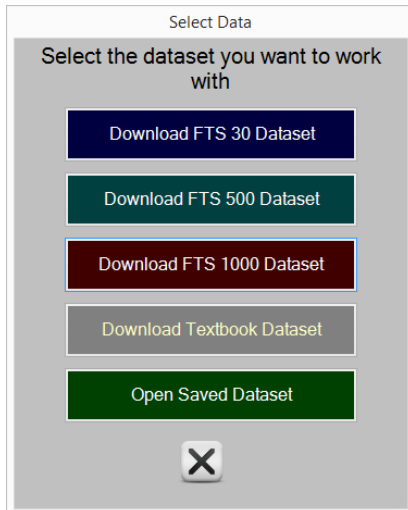
We will use the FTS 1000 Stock Case in the examples. We will use gross margin and operating cash flow as the fundamentals, though you are free to choose any.

Using Valuation Tutor

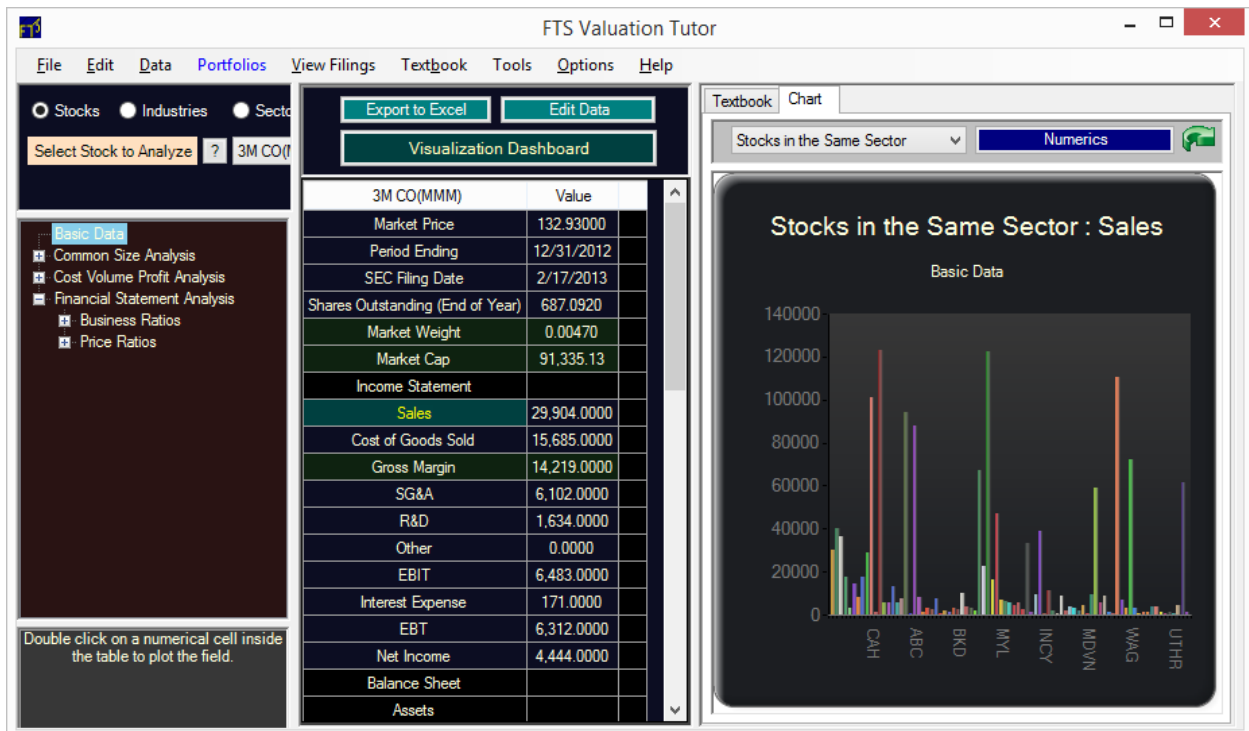
Launch Valuation Tutor and click “Financial Ratios: Visual Comparisons”



Then, click on the 1000 Stock Dataset



You will see this screen, with “Basic Data” selected on the tree at the left.



It is showing you information from the financial statements of 3M, and the chart compares any field (such as Sales”) to a comparison set; the picture is for “Stocks in the Same Sector.”

- **Above the chart**
 - The dropdown menu above the chart lets you select other comparisons, including entering a set of ticker and including all stocks in the data set.
 - The “Numeric” button is important for this project: it gives you numeric values for all fields for all companies in your comparison set; you can export these to Excel and use them to create your portfolio weights.

- **The tree on the left**

- The tree on the left lets you analyze and compare companies on a variety of dimensions.
 - Each branch of the tree has various calculators, arranged by concept.
 - Just click on the branches of the tree to see what is covered.
- The concepts, and how we calculate them, are explained in the textbook (available in the tab containing the chart).

We are interested in gross margin and cash flow from operations. You can see “Gross Margin” in the grid in the middle, and if you scroll down, you will see cash flow from operations.

Note: if you want to use gross margin divided by assets, select the “Common Size” analysis branch of the tree and choose the “Total Assets” calculator; this shows you variables like sales and gross margin divided by total assets. There are many fundamental variables and ratios that you can use.

In the comparison dropdown, select “All Stocks in the Data Set” and then click the “Numerics” button:



Now you can see all the data for all stocks. Scroll over to see Gross Margin, and scroll over further to see Cash Flow from Operations:

Basic Data

Edit Options

Results Deciles/Quintiles Proportions

Hide Chart Dot Size < > ? Search Tickers

Double click on a numerical cell inside the table to plot the field. Ma

	Annual Dividend	Cash Flow from Operations
3M CO(MMM)	2.3796	5,300.0000
AVX CORP(AVX)	0.3010	194.7950
AARON'S INC(AAN)	0.0772	59.7540
ABBOTT LABORATORIES(ABT)	2.0187	9,314.4010
ADVANCED MICRO DEVICES(AMD)	0.0000	-338.0000
AETNA INC(AET)	0.7299	1,822.0000

Note the proportions tab: it automatically calculates the proportion of each fundamental field needed for the fundamental weights:

	Equity	Annual Dividend	Cash Flow from Operations	Net Cash used in Investments
3M CO(MMM)		0.002550	0.003056	
AVX CORP(AVX)		0.000323	0.000112	
AARON'S INC(AAN)		0.000083	0.000034	
ABBOTT LABORATORIES(ABT)		0.002163	0.005371	
ADVANCED MICRO DEVICES(AMD)		0.000000	-0.000195	
AETNA INC(AET)		0.000782	0.001051	
AIR PRODUCTS & CHEMICALS INC(APD)		0.002870	0.000904	
ALCOA INC(AA)		0.000131	0.000863	

The Edit menu lets you export these proportions to Excel.

Notes:

- When you export to Excel, it adds a column with the ticker; this makes it easy to use the portfolio rebalancer, as you will see below.
- If you click on a column header, the values in the table are sorted based on that column. If you click it again, it sorts in the opposite direction.

In Excel, delete the columns you don't want (i.e. all except Gross Margin and Cash Flow from Operations") **except the ticker column** and add a little color to get:

Book1 - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Team

Clipboard Font Alignment Number Styles Cells Editing

A3

	A	B	C	D	E
1	As of 2/26/2014				
2	Basic Data				
3		Ticker	Gross Margin	Cash Flow from Operations	
4	3M CO(MMM)	MMM	0.004114	0.003056	
5	AVX CORP(AVX)	AVX	0.000076	0.000112	
6	AARON'S INC(AAN)	AAN	0.000333	0.000034	
7	ABBOTT LABORATORIES(ABT)	ABT	0.007257	0.005371	
8	ADVANCED MICRO DEVICES(AMD)	AMD	0.000637	-0.000195	
9	AETNA INC(AET)	AET	0.002739	0.001051	
10	AIR PRODUCTS & CHEMICALS INC(APD)	APD	0.000784	0.000904	
11	ALCOA INC(AA)	AA	0.000588	0.000863	
12	BEAM INC(BEAM)	BEAM	0.000411	0.000218	
13	AMERICAN ELECTRIC POWER CO(AEP)	AEP	0.000869	0.002194	
14	AMERICAN EXPRESS CO(AXP)	AXP	0.002428	0.004084	
15	AFLAC INC(AFL)	AFL	0.00132	0.008622	
16	AMERICAN INTERNATIONAL GROUP(AIG)	AIG	0.003453	0.002083	
17	AMERICAN NATIONAL INSURANCE(ANAT)	ANAT	0.000079	0.000275	
18	AMETEK INC(AMF)	AMF	0.000326	0.000353	

BasicData Comp Sheet1 Sheet2 Sheet3

Ready 100%

Notes:

- If there are stocks you want to eliminate, you should do that now. Don't leave any blank rows.
- **Price based values**
 - "Common Size Analysis" in the tree has a calculator where you can see the variables on a per share basis divided by price. If you want to use a price-based strategy to select a subset of stocks:
 - Select that calculator
 - Then use all stocks in your comparison set and click numeric
 - Then sort by clicking on a column header to see which stocks are the cheapest or most expensive.
- If you use the equity portfolio rebalancer, you do not have to worry about the sum of the weights being one after you remove some stocks; it will adjust the weights for you.

Implementing the trades

We now have the tickers and the proportions. So we need to buy and sell.

Decide on a dollar amount to invest. For example, if you start with \$1m, you could start with 850,000. The reason for leaving some cash is that you will have to pay transactions costs. And if you short sell some stocks, you will need money to finance the short sale.

Log in to the FTS Real Time Client (the newest Windows version), and we assume you have an account for the 1000 stock case. Then, launch the Equity Portfolio Rebalancer.

- Since this is the first time you are creating a portfolio, enter the amount to invest, e.g. 850000, into the box “Additional Amount.”
- Now, follow the instructions in [this document](#).
- Once you read in your portfolio weights, it will tell you the cash required for the trading. You can increase or decrease the “Additional Amount” based on this information
- It can automatically implement your trades for you.

Using the FSA Module

The FSA module is more powerful because it can handle data over time (quarterly as well as annual). But it requires you to import the data yourself. This data must be downloaded (through your university subscription) from either Compustat or Morningstar. Instructions are at:

- [Using Compustat Data](#)
- [Using Morningstar Data](#)

The rest is fairly straightforward: you will see variables like the gross margin under “Income Statement Variables” and variables like the cash flow from operations in the “Cash Flow Statement Variables.”

Statistics (averages, volatility, growth rates as well as linear forecasts) are in the “Statistics” tab:

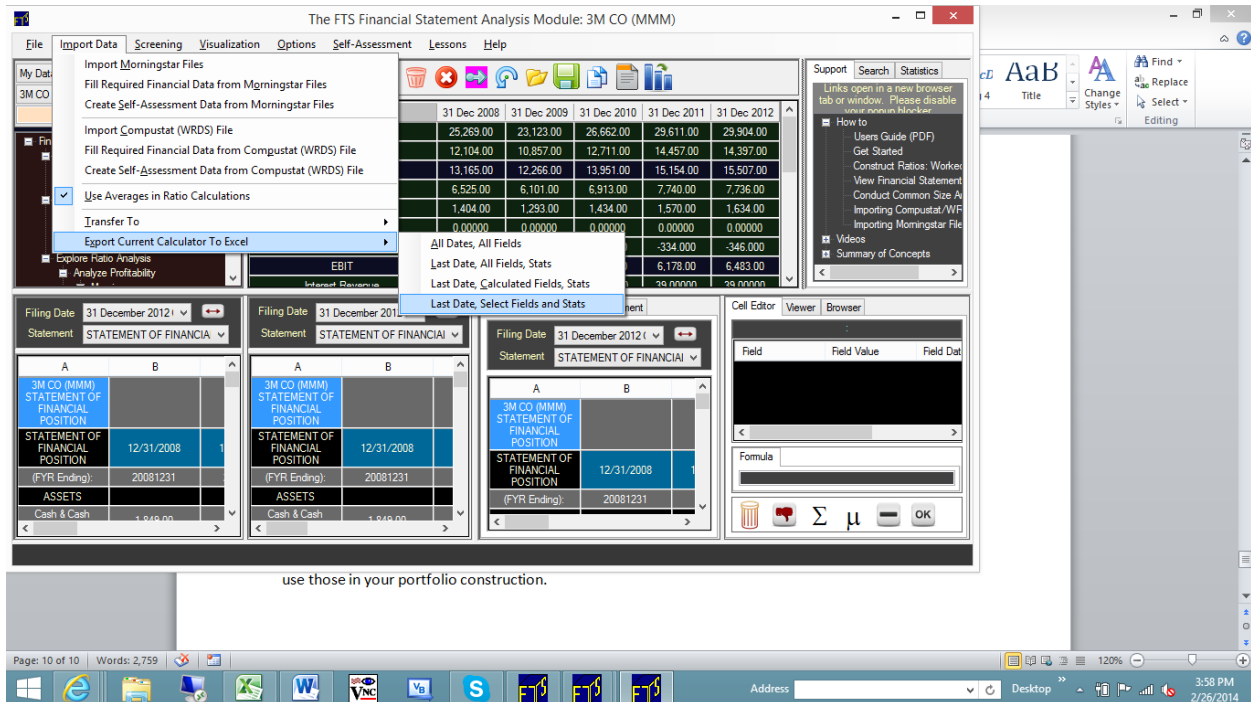
The screenshot displays the FTS Financial Statement Analysis Module interface. The main window title is "The FTS Financial Statement Analysis Module: 3M CO (MMM)". The interface is divided into several sections:

- Menu Bar:** File, Import Data, Screening, Visualization, Options, Self-Assessment, Lessons, Help.
- Toolbar:** Contains various icons for file operations and analysis.
- Main Workspace:**
 - Top-Left:** "My Data: SP100" and "3M CO (MMM)".
 - Top-Right:** A table with columns for "Average", "Volatility", and "Intercept".

	Average	Volatility	Intercept
sales	26,913.80	2,582.83	22,186.4
Gross Margin	12,905.20	1,379.01	10,449.4
SG&A	14,008.60	1,209.03	11,737.0
R&D	7,003.00	652.79	5,784.7
Lease Expense	1,467.00	121.52	1,245.9
Other Operating Expenses	0.00	0	0.00
 - Bottom-Left:** A "STATEMENT OF FINANCIAL POSITION" table with columns for "A" and "B".

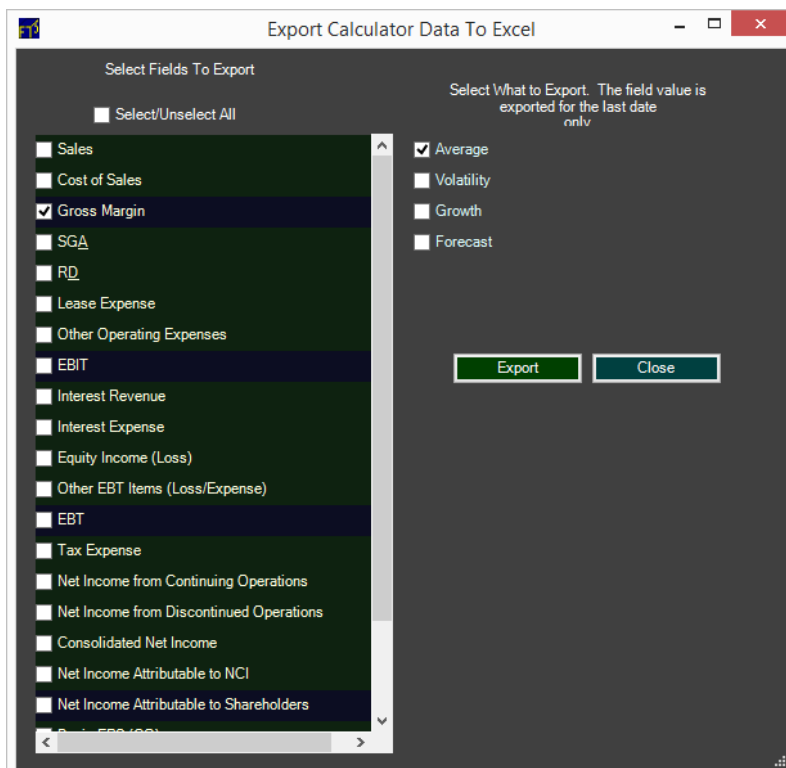
	A	B
3M CO (MMM) STATEMENT OF FINANCIAL POSITION		
STATEMENT OF FINANCIAL POSITION	12/31/2008	12/31/2009
(FYR Ending):	20081231	20091231
ASSETS		
Cash & Cash	1,810.00	2,010.00
 - Bottom-Right:** A "Cell Editor" with a "Field Value" and "Field Date".

The Import menu (where you import the data from either source) has an “export” function as well, where you can select the fields to export. You can also export averages and growth rates if you want to use those in your portfolio construction:



use those in your portfolio construction.

The “Last Date, Select Fields and Stats” lets you export fields selectively:



So using a 5-year average of gross margin becomes easy: just download 5 years of data and export the average.

In Excel, you will have to collate the columns and calculate the portfolio weights. You can then use the Equity Portfolio Rebalancer to implement the trades.