FTS Real Time Project: Value Investing

In this project, your objective is to try and "beat the market" using a series of techniques used by value-investors. A value investor buys stocks that they think are worth more than the price in the market. The project has several steps, and is based on the FTS 1000 stock case and the FTS Real Time Client (RTFTS). You will do the following:

- Select stocks based on fundamentals
    - You can use different tools for this. In the project, we describe how to use the FTS Heat Maps. These heat maps let you select stocks based on factors that academic studies have shown to be important in understanding stock performance.
    - Based on this analysis, you will reduce the number of stocks you will study in detail to between 8 and 16.
- Analysis of the stocks
    - In the second stage, you will analyze the 8-16 stocks in detail, including calculating the future prospects of the companies and applying a discounted cash flow (DCF) model to the problem of valuing a stock and estimating the expected return of each stock.
- Portfolio Construction
    - In the third stage, you will use diversification techniques to construct a portfolio of the stocks. This part will be done using your expected return estimates and risk information from RTFTS. You will learn how use Excel's Solver in this part.
- Portfolio Management
    - The next part is to manage the portfolio. This includes rebalancing the portfolio, re-optimizing, perhaps adjusting your expected return calculations as more information comes out.
- Performance Analysis
    - Finally, you will compare the performance of your portfolio to the market benchmark and see if you were able to beat the market.

In completing this project, you will work with real world data and gain experience with the many judgment calls that need to made when applying DCF models to real world companies. The FTS tools required to complete this project are designed to develop your real world problem solving skills by working on the problem in small teams.

Note: **If your university does not subscribe to FTS but you want to use this project, please contact us at ftsweb@gmail.com**

Project Deliverables

The deliverables required from the project are threefold. First, you must describe your strategy for reducing the number of stocks. Second, you need to interpret and summarize your trading performance. RTFTS provides a measurement of your performance along several dimensions both relative to the class as a whole and relative to the S&P500. These dimensions are measured relative to the S&P500 index and relative to other teams. Each dimension is weighted equally unless your instructor chooses to change the weights. Third, depending upon time allocated to this project your instructor may have to provide a small team presentation that combines both the qualitative (e.g., your strategy, your realized and predicted performance, what worked what didn't and recommendations for the future).

Background Information

In this project you will reduce the FTS 1000 stocks to about 8-16 stocks that you want to work in detail with. This is a typical number used by value investors. Your goal is to identify stocks that you predict provide a strong margin-of-safety between the spot market price and your assessed intrinsic value. That is, the set of stocks which you expect will deliver abnormal returns relative to the market as a whole.

To help you first narrow down from the approximately 1000 stocks in the Russell 1000 to a more manageable number you will first use the RTFTS heat maps. The FTS heat maps provide both current and historic performance along a number of important dimensions and variables. Second, you will then assess the intrinsic value of these stocks using a popular discounted cash flow technique for valuing stocks. This is the constant growth dividend model. You will quickly discover that unlike common textbook examples this model is not so straightforward to implement in practice. Applying this model requires that each of the major inputs require estimation. In addition some stocks do not pay dividends and thus you will learn the difference between a legal definition of a dividend and an economic concept of a dividend.

By completing this project you will master the skills required to estimate these variables by working with the specially designed set of tools provided by the FTS System.

Academic Studies

A classic test for any investor is to compare the performance of their investment portfolio against the performance of the S&P500 index. This has become a standard in the professional industry to judge financial planners and fund managers against. However, financial markets are also predicted to reward risk with additional return and therefore academic studies when claiming abnormal return performance are careful to make further adjustments for risk. As a result, academic studies face two challenges. First, is to demonstrate that some anomaly exists that generates abnormal returns after controlling for known risk factors. Second, is to identify a theory that can provide an explanation or at least significant insights into what may be driving the anomaly.

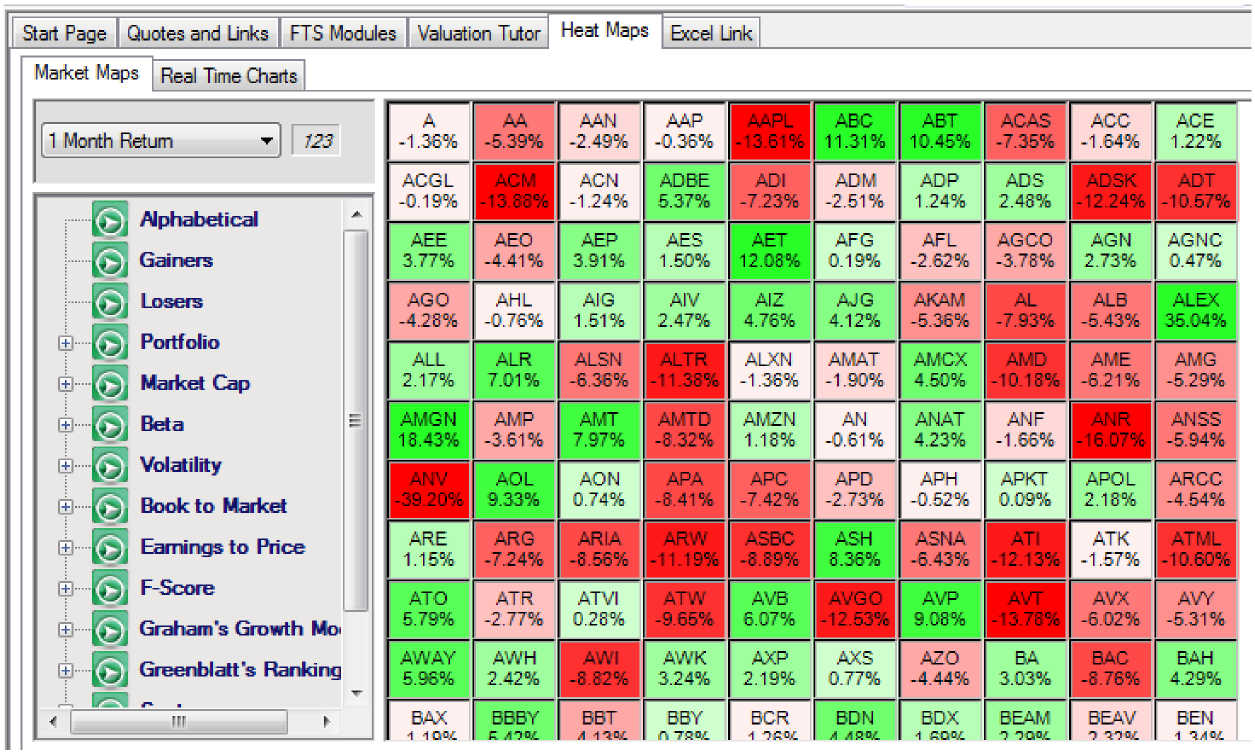
One technique used in these academic studies is to build reference market portfolios, often referred to as decile portfolios, along some variable or set of variables, and then measure returns in period t+1 relative to a broad market benchmark controlling for these variables. For example, this benchmark portfolio may be matched in terms firm size, book-to-market, CAPM returns, Fama and French returns and so on. In addition, these studies are careful to use only data available to the market at the time of forming a portfolio to avoid biases such as the “look ahead” and “hindsight biases.” These studies have identified a range of market anomalies with major ones being Post Earnings Announcement Drift (PEAD), Momentum, and the Accruals Phenomena. The first two identify situations where price changes are not independent over time but instead “drift” in the direction of some predictable trend. The third identifies situations where differences in the persistence in fundamentals (cash flows versus accounting accruals) do not appear to be reflected in market returns. The implication of an anomaly is that excess or abnormal returns in the market can be earned even after adjusting for risk.

In this project you do not have to worry about “look-ahead” and “perfect hindsight” biases because you are running live. That is, you can design your strategy from past data but you must implement your strategy over a live trading period. To help you with this task you will first use the heat maps provided by the RTFTS Position Manager which includes both back tests and decile analysis to help you first reduce the number of stocks down to a manageable number.

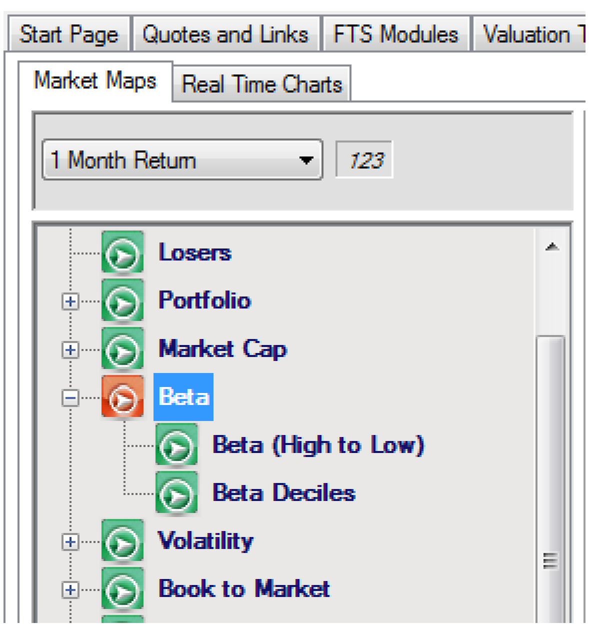
The second challenge facing academic studies is to come up with a theory that can explain what may be driving the abnormal returns. That is, an anomaly is only an anomaly if there is no good theory of why the abnormal return persists. An abnormal return arises by definition when it can be predicted that realized return exceeds the benchmark’s risk adjusted return or some theoretical prediction. The discounted cash flow model of intrinsic value provides a theoretical prediction of expected return. The main objective of this project is to try and identify abnormal returns relative to the discounted cash flow techniques. As a result, an important part of the project is to learn how to apply some fundamental valuation techniques.

Step 1: Working with Heat Maps

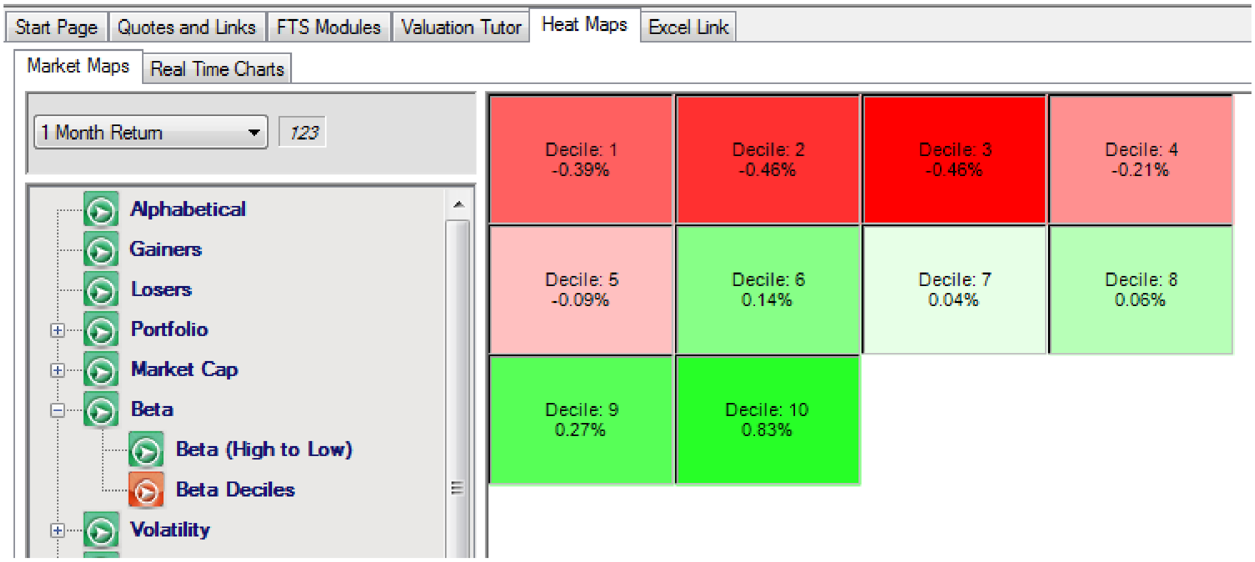
In the RTFTS, log in to the FTS 1000 case and click on the Heat Maps tab, which will bring up a screen like the one depicted below:



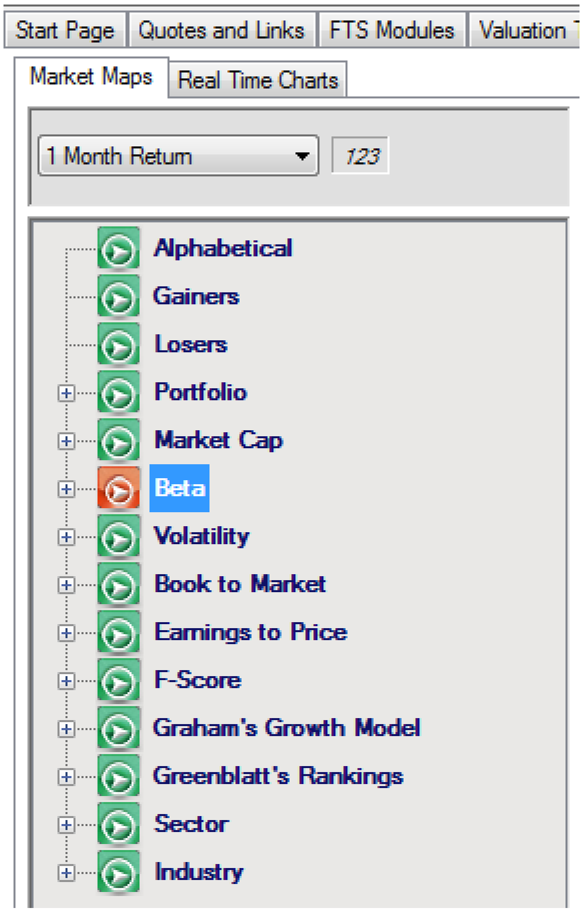
Suppose you first choose to screen on Beta. Click on Beta to reveal the following. That is, you can examine the either the individual sorted or decile heat maps for any of the variables provided.



Consider, Beta for example. You can see the ranked heat map from high to low or the decile heat map. Further, you can see how beta stocks have performed today, 1-month, 3-month, 6-month and 12-months. So for example, over the last month from April 20, 2013 low beta stocks have outperformed high beta stocks in the FTS 1000 stocks.



Similarly, you can do the same for any of the heat map variables:



By clicking on a decile you can identify the set of stocks included in that decile. Thus by using the heat maps and any criteria of your team chooses you can focus upon refining the set of stocks along your selected variables. In this stage of the project you should select approximately twenty five to thirty stocks to start your more intensive investigation.

Step 2: Understanding a Discounted Cash Flow Valuation Model

In this project we will work with the constant dividend growth model of intrinsic value for a stock. In "Finance 101" you learn that the intrinsic value of a stock is the present value of all future dividends. Historically, John Williams was one of the first to study mathematically various models of the intrinsic value of a stock in his now classic 1938 text, "The Theory of Investment Value." He credited this definition of intrinsic value to Robert F. Wiese, "Investing for True Values," Barron's, September 8, 1930 who defined the intrinsic value of a stock as:

"The proper price of any security, whether a stock or a bond, is the sum of all future income payments discounted at the current rate of interest in order to arrive at the present value."

Williams (1938) further refined this to:

"Let us define the investment value of a stock as the present worth of all dividends. "

Williams explored the effect of different assumptions on growth including the simple model that is implied from assuming constant growth. Today, the constant dividend growth model for time t, is expressed as:

$\text{Price}_t = \text{Dividend}_{t+1}/(\text{Cost of equity capital} - \text{Growth})$

Where today the cost of equity capital is understood to be equivalent to the return investors' require and thus can be re-arranged to reveal:

$\text{Cost of Equity Capital} = \text{Dividend}_{t+1}/\text{Price}_t + \text{Growth}$

What is the implied expected return from the constant dividend growth model?

$\text{Expected Return} = \text{Dividend Yield} + (P_{t+1} - P_t)/P_t$

The above holds because under the constant dividend growth model an investor earns their expected return from two sources, the dividend plus the capital gain. The dividend yield is constant and you can verify that that the capital gain equals g. As a result it is immediate that:

Expected Return = Cost of Equity Capital

It is important to note that equality between the last two boxed lines above is only if the spot price of the stock equals the assessed intrinsic value given the discounted cash flow model. If this is not equal then there exists, in the words of Benjamin Graham or a Warren Buffet, a positive *margin of safety*.

Summary:

Your task is to identify a set of 8-16 stocks for which the expected return given the spot stock price is higher than the predicted expected return. That is, a set of stocks for which you predict the last two boxed lines above are *not equal*. This will be the case whenever you have identified stocks that Benjamin Graham would describe as providing a positive margin of safety because the spot price is less than the assessed intrinsic value of the stock.

Step 3: Predicting Abnormal Returns

To identify stocks that are expected to provide a positive margin of safety a value investor will work directly with the fundamentals identified in the right hand side of the constant dividend growth model so that they can compare this predicted value to the current stock price.

In a simple textbook example this may appear to be trivial to check out but in the real world this exercise will teach you real skills that are applicable to any valuation problem. You quickly learn that each of the major variables in the model require estimation and the value of completing this project is that you will master the skills required to estimate these variables by working with the set of tools provided by the FTS System.

Summary

There are three main inputs required for the constant dividend growth model:

i. Either current or next period's dividend
ii. Constant dividend growth estimate
iii. Cost of equity capital

In the following sections we compute each of these.

1. Estimating Constant Growth

A long history of dividend information is available for IBM from Yahoo finance (Historical Prices). For IBM this dates back to 1962.

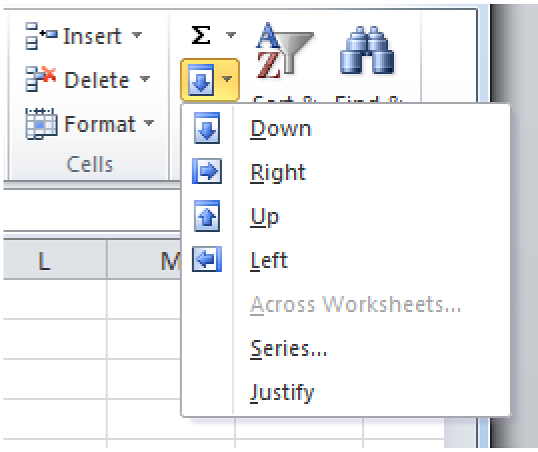
First we will download this data into Excel and then estimate IBM's dividend growth over this long run.

Clicking on "Get Prices" and then at the bottom of the Yahoo screen click on "Download to Spreadsheet" gets dividends into Excel.

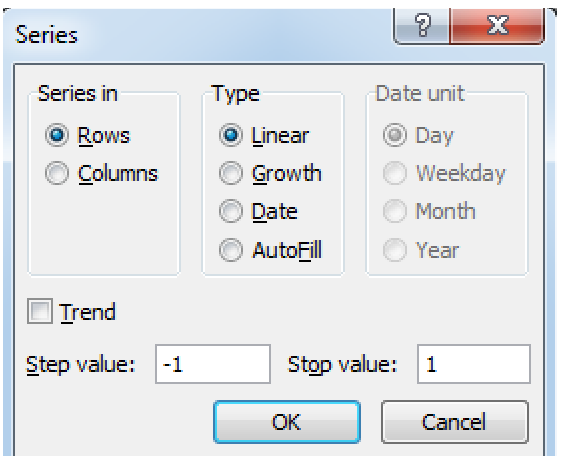
	A	B
1	Date	Dividends
2	2/6/2013	0.85
3	11/7/2012	0.85
4	8/8/2012	0.85
5	5/8/2012	0.85
6	2/8/2012	0.75

In this example there are 202 quarterly dividends and in Excel, give column C the header "Quarter" and fill column C with the numbers 21 through to 202 starting in column C row 2:

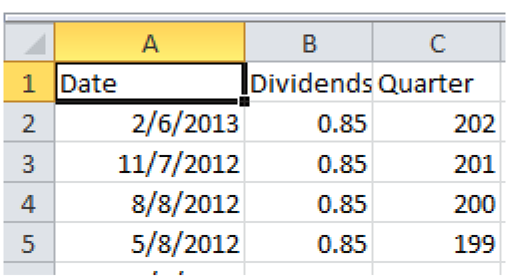
To do this, enter 202 into cell C2, give focus to C2 and then click on the series icon:



Select Series .....



Click on OK to fill: Excel will automatically fill the column starting with 202 down to 1.



	A	B	C
1	Date	Dividends	Quarter
2	2/6/2013	0.85	202
3	11/7/2012	0.85	201
4	8/8/2012	0.85	200
5	5/8/2012	0.85	199

Finally, in column D compute =+Ln(B2) and then copy and paste from D2 through to the last dividend to take the natural log of each dividend. You can then compute the growth coefficient directly from a log linear regression as follows:

You can use Excel's regression add in[1] and select the column of natural logs as the Y or Dependent Variable and the column of quarters as the X- or independent variable. The regression coefficient gives the growth in quarterly dividends directly for IBM.

F	G	H	I	J	K
Regression Statistics					
Multiple F	0.716606				
R Square	0.513524				
Adjusted I	0.511092				
Standard E	1.125668				
Observati	202				
ANOVA					
	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	267.5158	267.5158	211.1199	3.98E-33
Residual	200	253.4255	1.267128		
Total	201	520.9413			
	Coefficient	*andard Err*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-4.27285	0.158993	-26.8744	2.64E-68	-4.58637
X Variable	0.019735	0.001358	14.52997	3.98E-33	0.017057

That is 0.019735 for a quarter or 4*0.019735 = 0.078941 or 7.89% annualized.

We will use the latter estimate which is still conducted over approximately 25-years.

Note: In the approach above you will develop a set of important Excel skills that carry over to other problems. Once you have reinforced these skills for a couple of stocks you may then find that to do a lot of these calculations it easier to work directly with FTS FSA Module's constant growth model calculator that you need for other parts of this project. This will let you paste the dividend series directly into a regression calculator.

2. Calculating the Cost of Equity Capital

Here we will use CAPM as our estimate of the cost of equity capital. This requires getting three inputs:

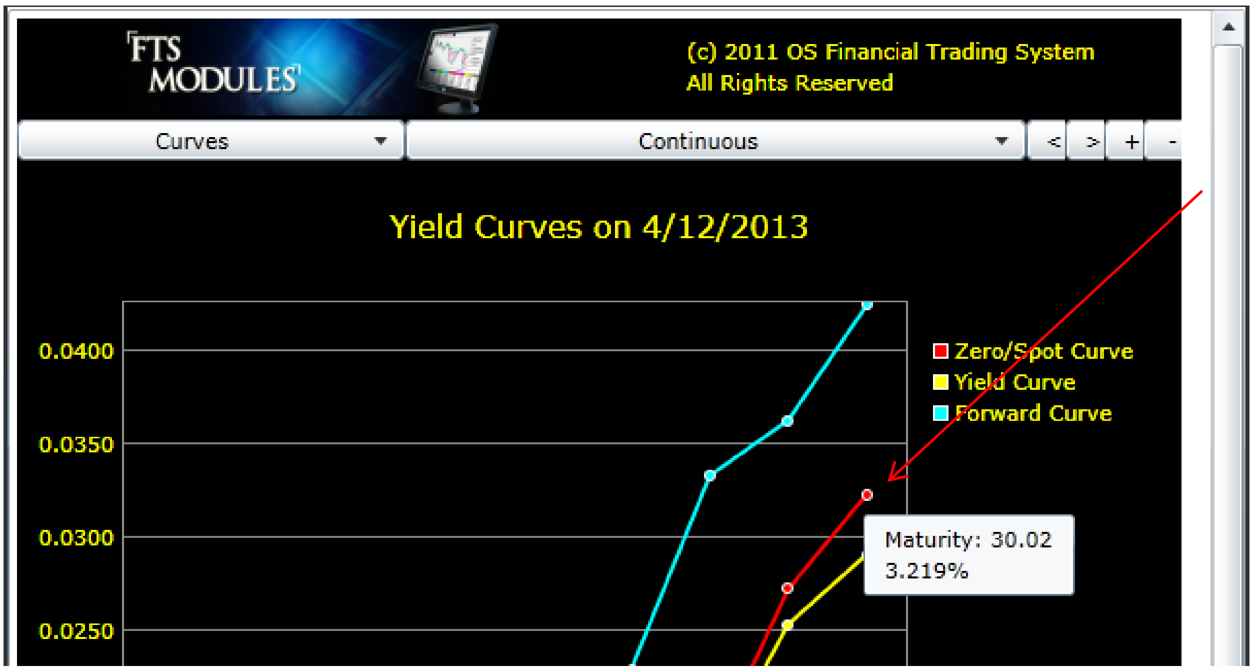
The bootstrapped zero coupon bond risk free rate from either a 10-year or 30-year US Treasury Note/Bond. We will use the 30-year bond rate because typically the yield to maturity is increasing with time to maturity and thus this provides a more conservative estimate of intrinsic value. In addition, we want the 30-year zero coupon bond rate which can be computed from the current yield curve. The FTS

[1] If you don't know how to access the regression add-in, you can consult this site: http://www.wikihow.com/Run-Regression-Analysis-in-Microsoft-Excel

Bond Tutor provides a current estimate of this rate that is automatically updated daily from the Federal Reserve Bank data:

http://bondtutor.com/currentYC/currentYC.htm

By holding the cursor over the little circle (see arrow pointing to this) at the end of the curve provides the latest bootstrapped rate as follows:



For additional information regarding bootstrapping and the US Treasury Yield curve we refer interested readers to:

http://bondtutor.com/bondtutortext/bondtutortext.htm

Zero Coupon Risk Free Rate (30-years) = 3.219%

Next we estimate beta for IBM. You can get this from the web at either:

Yahoo Finance (http://finance.yahoo.com/q/ks?s=IBM+Key+Statistics)

Trading Information	
Stock Price History	
Beta:	0.65
52-Week Change[3]:	3.23%
S&P500 52-Week Change[3]:	13.35%

Google Finance

https://www.google.com/finance?cid=18241

Range	209.20 - 211.50	Div/yield	0.85/1.61
52 week	181.85 - 215.90	EPS	14.41
Open	210.84	Shares	1.11B
Vol / Avg.	1.20M/3.62M	Beta	0.69
Mkt cap	235.62B	Inst. own	60%
P/E	14.67		

Or MSN Money:

http://investing.money.msn.com/investments/stock-price?Symbol=ibm&ocid=qbeb

FINANCIAL HIGHLIGHTS	
Sales*	104.51 Bil
Income*	16.60 Bil
Sales Growth*	-2.30%
Income Growth*	+4.70%
Net Profit Margin	15.89%
Debt/Equity Ratio	1.76
Beta	0.70

All sites are in reasonable agreement with Google and MSN around 0.69 to 0.70. We will assume IBM's beta is around 0.70.

Finally, the equity premium needs estimating. An annual survey f the equity premium by country is performed by Pablo Fernandez and colleagues. A search of the SSRN for the current paper will provide a good estimate of the equity premium:

Abstract
http://ssrn.com/abstract=2084213

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Market Risk Premium Used in 82 Countries in 2012: A Survey with 7,192 Answers

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Abstract:
This paper contains the statistics of the Equity Premium or Market Risk Premium (MRP) used in 2012 for 82 countries. We got answers for 93 countries, but we only report the results for 82 countries with more than 5 answers.

For the US this is currently estimated to be:

Table 2. Market Risk Premium (%) used for 82 countries in 2012

	Average	Median	St. Dev.	min	Q1	Q3	MAX	Number of answers	MAX-min
USA	5.5	5.4	1.6	1.5	4.5	6.0	15.0	2,223	13.5
Spain	6.0	5.5	1.6	3.0	5.0	6.3	15.0	958	12.0
Germany	5.5	5.0	1.9	1.0	4.5	6.0	17.0	281	16.0
United Kingdom	5.5	5.0	1.9	1.5	4.5	6.0	22.0	171	20.5
Italy	5.6	5.5	1.4	2.0	4.8	6.1	10.0	120	8.0
Canada	5.4	5.5	1.3	3.4	4.7	6.0	10.5	94	7.1
Mexico	7.5	6.8	2.6	3.0	6.0	9.0	20.0	87	17.0
Brazil	7.9	7.0	4.7	1.8	5.3	8.6	30.0	86	28.2
France	5.9	6.0	1.5	2.0	5.0	6.1	11.4	85	9.4
China	8.7	7.1	4.6	3.9	6.6	9.4	30.0	82	26.1
Australia	5.9	6.0	1.4	3.0	5.0	6.0	10.0	73	7.0

That is the mean estimate is 5.5%

Pulling the above together the CAPM estimate for IBM's cost of equity capital is:

k_e = 0.03219 + 0.7*.055 = 0.07069 or 7.1%.

Practical Problem

The constant growth model requires that the cost of equity capital be greater than the constant dividend growth or otherwise the intrinsic value becomes undefined. This is the case if we applied the constant growth for IBM estimated over the last 50 or so years.

To overcome this problem we will adjust IBM's Beta to allow for mean reversion over time. That is, over the long run betas tend to revert to the mean of 1. This has been empirically documented and as a result a popular technique for estimating this effect is the "Blume Adjustment." This is simply:

Adjusted Beta = (2/3)*Beta + (1/3)*1 = 0.8

k_e = 0.03219 + 0.8*.055 = 0.07619 or 7.62%.

k – g is still negative.

As a result, suppose we estimate dividends over the previous 25-years (101 quarters instead of 202) then IBM's dividend growth reduces to 5.5171%. This provides a positive estimate for k –g assuming that IBM's dividend growth has declined over the most recent 25-years.

K – g = 0.0762 – 0.0552 = 0.0210

3. Dividends

Finally, we apply the dividend growth model using our estimated constant growth. As another practical note this may deviate from current dividend estimates for IBM but constant growth is a long term constant growth estimate whereas dividend policy in practice often evolves in a step function manner. That is, it is not unusual for a one year dividend growth estimate to be flat and then suddenly step up at a different implied rate of growth to the constant estimate. This is the case currently for IBM which as reported on Yahoo the forward (i.e., expected dividend) and trailing (most recent four quarters) dividends are equal ($3.40 per share):

Dividends & Splits	
Forward Annual Dividend Rate[4]:	3.40
Forward Annual Dividend Yield[4]:	1.60%
Trailing Annual Dividend Yield[3]:	3.40
Trailing Annual Dividend Yield[3]:	1.60%
5 Year Average Dividend Yield[4]:	1.80%

Collecting terms together we now have an estimated intrinsic value for IBM equal to:

Intrinsic Value = $3.40*1.0552/(0.0762 – 0.0552) = $167.49.

The intrinsic value of IBM using the unadjusted beta equals:

Intrinsic Value = $3.40*1.0552/(0.071 – 0.0552) = $222.07.

The actual expected return for IBM implied from IBM's current price of 209.26 (April 15, 2013) equals 0.0723 or 7.23% and IBM is a little undervalued relative to it's unadjusted beta.

Working with Limited Data

What if a stock does not have a large amount of dividend paying history?

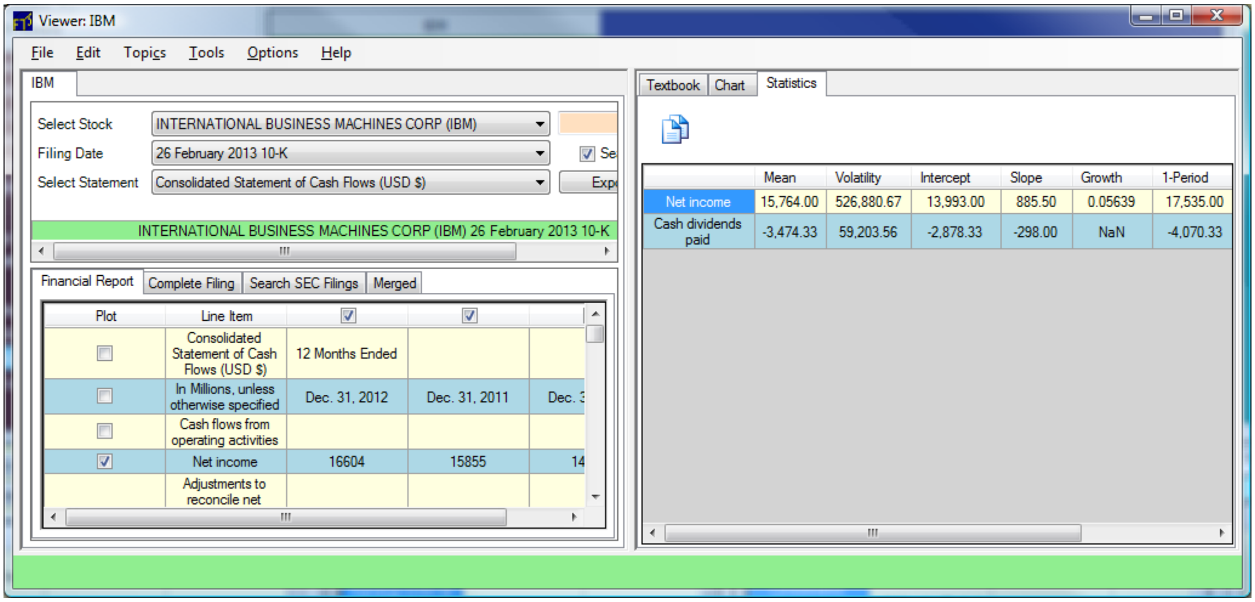
Suppose we did not have 50 or 25 years of dividend data to work with. Alternatively, if we wanted to check out IBM's growth estimate from alternative information we can apply the above discounted cash flow model in various equivalent ways.

Earnings Form of the Discounted Cash Flow Model

Consider the following earnings form this model expressed as:

$\text{Price}_t = \text{Earnings}_{t+1}$*Dividend Payout Ratio /(Cost of equity capital – Growth)

The dividend payout ratio we can get using the FTS FSA Module's Financial Statement Viewer as follows:



In the Viewer (which you can access from the Options menu), select the statement shown above, and check on Net Income and Cash Dividends paid. Then, look in the Statistics tab to see the averages. From this calculation, we get that

The average dividend payout ratio for IBM is: 3474.33/15764 = 0.22

Now by working with analyst earnings' forecast information we can project dividends at t+1 consistent with current analyst earnings' forecasts. Around April 15, 2013 the consensus 2013 earnings forecast for IBM was $16.77 per share. You can get the consensus forecast from various financial sites, including Yahoo finance. From this information the projected dividend for next year is:

$3.69 = 16.77*0.22

Furthermore, the consensus 5-year earnings' growth forecast was 10.49% for the next 5-years. The long run or "Normal growth" is the growth rate from beyond five years out forever (i.e., assuming a going concern). In reality the "forever" assumption is for mathematical convenience because with discounting the present value of future cash flows become smaller and smaller over realistic time horizons. As a result, the Normal growth rate for every stock, including IBM, must has to lie below the economy wide growth rate. Otherwise this would imply the contradiction that the stock can grow larger than the economy as a whole.

We can estimate normal growth for the US Economy from the real rate of growth which has been virtually stable at 1.8% for nearly 100-years. For the current implied inflation go to:

http://bondtutor.com/InflationExp/inflationexp.htm

As a result, a reasonable estimate for the current one plus nominal economy wide growth is: 1.018*1.0244 = 1.0428 or 4.28%.

Constant growth is a weighted average of abnormal and normal growth. Estimating this for the next twenty five years for IBM gives:

(1.1049^5*1.0428^25)^(1/25) = 5.5%.

The above estimate is very close to our estimate from the last 25-years of dividend history. As a result, we will work with 5.5% for IBM's constant dividend growth. However, by working with the consensus analyst earnings' forecast implies that we increase dividends to $3.69 for next year and thus the projected intrinsic value for IBM using a mean reverting beta is:

Intrinsic Value = $3.69/(0.0762 – 0.055) = $174.05.

The intrinsic value of IBM using the unadjusted beta equals:

Intrinsic Value = $3.69/(0.071 – 0.0552) = $233.54.

This pretty consistent with our estimates from our dividend analysis for IBM over the last 25-

years. As a result, our earlier estimate for IBM's expected return of around 7.2% seems reasonable given the analysis to date.

However, in 2012 Warren Buffet acquired large positions in IBM and so this does not appear to be a reasonable estimate for a value investor like a Warren Buffet? So it would appear that our analysis to date, which has followed traditional lines, is missing something significant!

We will identify what this is in the next section.

What if a Stock does not Pay Dividends?

Many stocks do not pay cash dividends. In fact it is a phenomenon that is usually associated with more mature stocks. As a result, what happens if the stocks you are interested in do not pay cash dividends?

Answering this question will require extending the application of the model from the legal concept of a dividend to an *economic concept* of a dividend. This will also give insight into the previous question raised relative to our analysis of IBM to date.

There are some immediate limitations associated with the strict legal definition of a dividend when valuing a stock. First, consider a stock can pay dividends that are equivalent to cash dividends. That is, a stock whose management engages in Treasury stock transactions provides an immediate example of this. Treasury shares are previously issued shares repurchased by management. Treasury stock repurchases are an equivalent way of paying dividends and in fact many stocks do both – pay cash dividends and engage in Treasury stock transactions.

IBM is one example.

However, in order to understand dividend policy at this broader level we need to first introduce the concept of economic dividends and Free Cash Flows.

Free Cash Flows and Economic Dividends

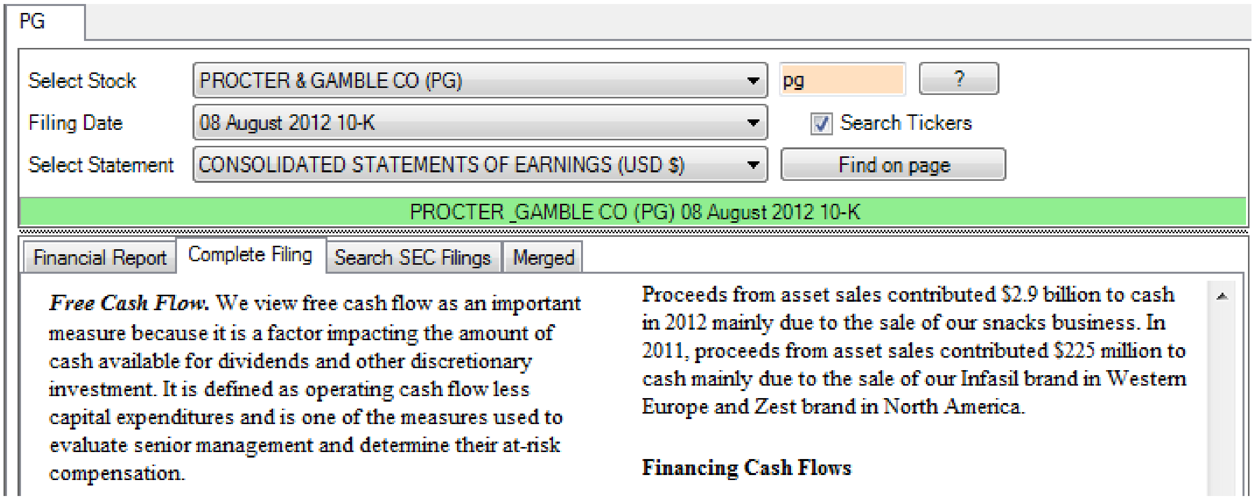
This concept measures the "*economic dividend*" for a firm which is the dividend a firm could pay if it chooses to do so. Free cash flows are widely used by non-financial institutions as a performance measure and for dividend policy and care must be taken to distinguish Free Cash Flows to the Firm (FCFF) from Free Cash Flows to the Equity holders of the firm (FCFE). Both of these important measures are non US GAAP measures but the accepted definitions are as follows. First, for FCFF:

Free Cash Flow to the Firm (FCFF) = Cash Flow from Operating Activities (CFO) plus Interest*(1 – Tax Rate) less Capital Expenditures (CAPEX)

Capital expenditure is required to support the existing capacity to provide goods and/or services and is referred to as CAPEX. In addition, new acquisitions are excluded when measuring current capital expenditure although the new acquisitions will affect projections of future capital expenditure.

The adjustment for interest net of tax is a technical adjustment that arises from US GAAP's inclusion of interest as an expense associated with operations. As a result, analysts usually reverse out the effects from interest from CFO.

We are interested in free cash flows because as described by the Proctor and Gamble management below this can be used to pay dividends and other discretionary investments (e.g., see the FSA Module):



The extension of FCFF to the related concept of "Free Cash Flow to Equity" (FCFE) makes additional adjustments for the contribution to capital expenditure from the debt-holders. This estimates the Free Cash Flow relative to shareholders:

Free Cash Flow to Equity (FCFE) = FCFF – Interest*(1 – Tax Rate) + Net Borrowing

That is, because debt-holders finance part of the Capital Expenditures the effects of debt-holders are taken into account when computing FCFE. In addition, the technical adjustment for US GAAP's treatment of interest is now reversed. Finally, the above immediately implies that FCFE will be larger than FCFF whenever net borrowings are positive.

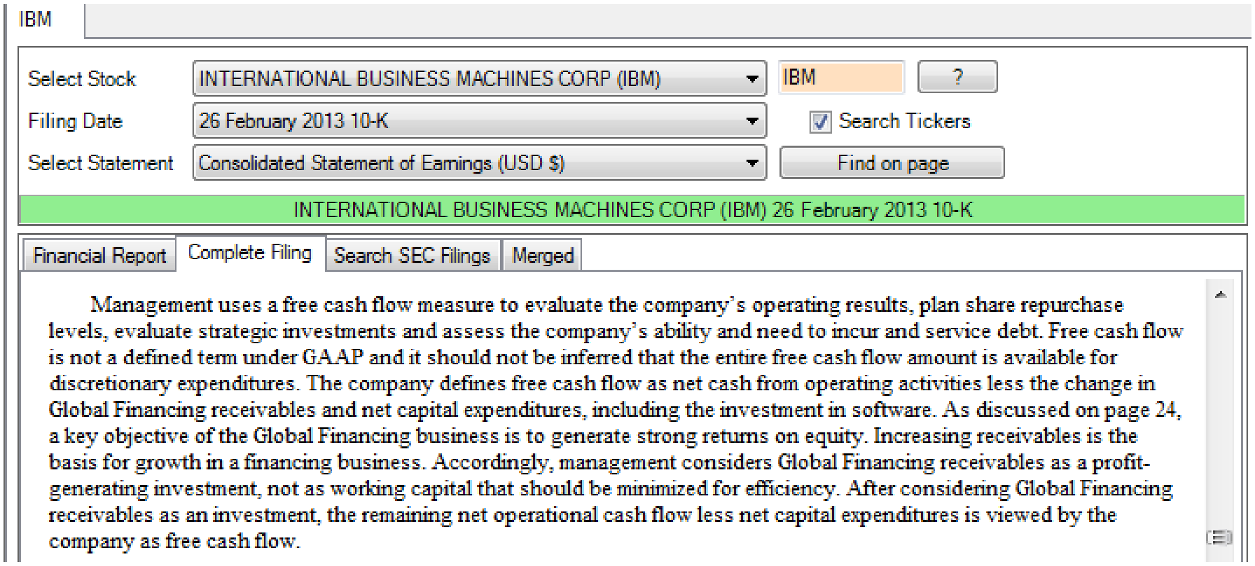
Two immediate observations from the above formulation are that FCFE maintains the economic equivalence of the legal requirement that dividends can only be paid after capital has been maintained. This is the requirement that cash dividends can only be paid out of retained earnings. Secondly, by comparing FCFF and FCFE to dividends paid you can immediately observe whether the dividends are funded from operations or whether net borrowing is required.

Conceptually, however, FCFE is the free cash available to equity holders and therefore irrespective of whether or not a company actually pays dividends the FCFE per share provides a measure of the dividends it could pay after maintaining productive capacity for producing goods and or services. You can then use this number in a constant dividend growth or equivalent discounted cash flow model to project the value of the stock.

Example: Calculating FCFE Per Share for IBM

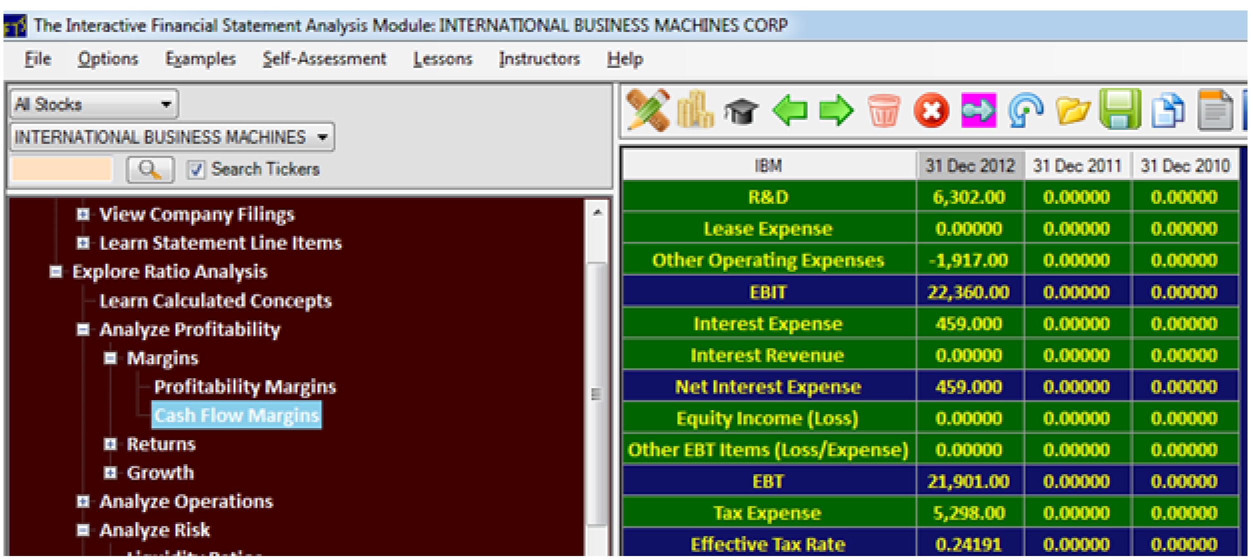
FCFE is a non US GAAP number and therefore this is an area that requires developing your professional judgment to compute. If you have access to estimates made by management r other data feeds then it is important that you understand what assumptions are being slipped in. This is because analysts and management will generate different numbers for estimates of FCFF. In the IBM example we will see that IBM is no exception to this.

IBM, similar to many other companies, place significant weight upon Free Cash Flows for their planning and control as indicated below:



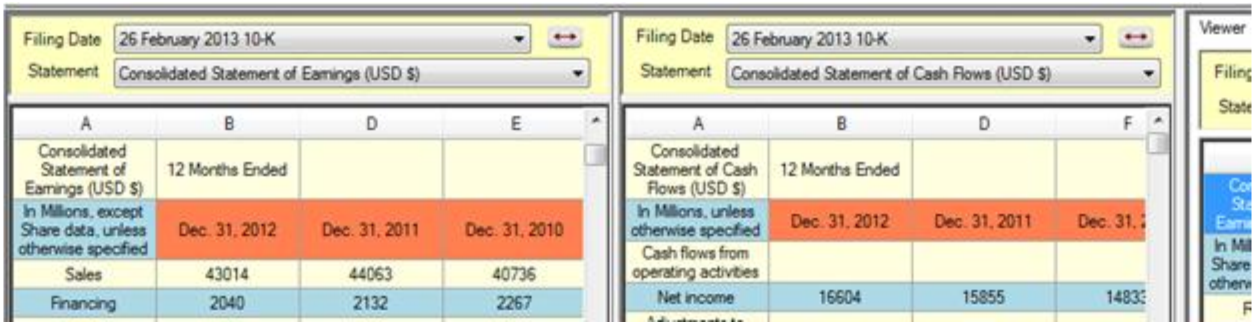
IBM Example: Free Cash Flow to Equity

Launch the FSA Module, enter IBM and select Cash Flow Margins. You can drag and drop the dates and the values in the first column from the Income Statement and Cash Flow Statement.

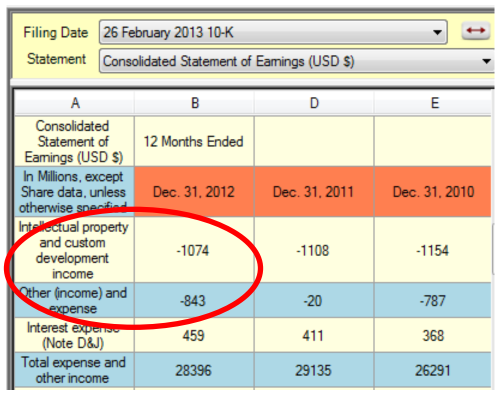


IBM	31 Dec 2012	31 Dec 2011	31 Dec 2010
R&D	6,302.00	0.00000	0.00000
Lease Expense	0.00000	0.00000	0.00000
Other Operating Expenses	-1,917.00	0.00000	0.00000
EBIT	22,360.00	0.00000	0.00000
Interest Expense	459.000	0.00000	0.00000
Interest Revenue	0.00000	0.00000	0.00000
Net Interest Expense	459.000	0.00000	0.00000
Equity Income (Loss)	0.00000	0.00000	0.00000
Other EBT Items (Loss/Expense)	0.00000	0.00000	0.00000
EBT	21,901.00	0.00000	0.00000
Tax Expense	5,298.00	0.00000	0.00000
Effective Tax Rate	0.24191	0.00000	0.00000

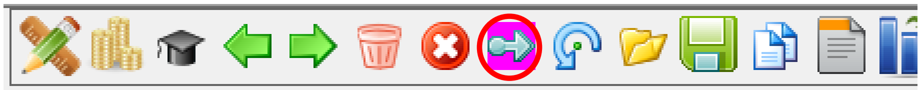
Below the calculator are the statements this data came from:



Aside: For the number in Other Operating Expenses this is the sum of Intellectual Property … and Other (income) … as circled below. Drag and drop each number into the Other Operating Expense cell and then use the cell editor in the bottom RHS of the screen to sum the two entries. This also creates the appropriate equation required for the next step which will automatically fill in the numbers for 2011 and 2010 without any more dragging and dropping.



To automatically fill in the equivalent numbers for the previous two years click on a cell inside of 2011 (e.g., Sales) and then click on the circled icon. You can repeat this for 2010 and the results are provided below:



IBM	31 Dec 2012	31 Dec 2011	31 Dec 2010
Sales	104,507.00	106,916.00	99,870.00
Cost of Sales	54,209.00	56,778.00	53,857.00
SG&A	23,553.00	23,594.00	21,837.00
R&D	6,302.00	6,258.00	6,026.00
Lease Expense	0.00000	0.00000	0.00000
Other Operating Expenses	-1,917.00	-1,128.00	-1,941.00
EBIT	22,360.00	21,414.00	20,091.00
Interest Expense	459.000	411.000	368.000
Interest Revenue	0.00000	0.00000	0.00000
Net Interest Expense	459.000	411.000	368.000
Equity Income (Loss)	0.00000	0.00000	0.00000
Other EBT Items (Loss/Expense)	0.00000	0.00000	0.00000
EBT	21,901.00	21,003.00	19,723.00
Tax Expense	5,298.00	5,148.00	4,890.00
Effective Tax Rate	0.24191	0.24511	0.24793
Cash Flow from Operations	19,586.00	19,846.00	19,549.00

To complete the calculation of FCFF you will need to estimate the Capital Expenditure (CAPEX) for IBM. Some companies list CAPEX as a line item in their cash flow statement but this is not the case for IBM. However, we can compute CAPEX following our rules:

IBM

Select Stock: INTERNATIONAL BUSINESS MACHINES CORP (IBM) ?

Filing Date: 26 February 2013 10-K — Search Tickers

Select Statement: Consolidated Statement of Cash Flows (USD $) — Export to Excel

INTERNATIONAL BUSINESS MACHINES CORP (IBM) 26 February 2013 10-K

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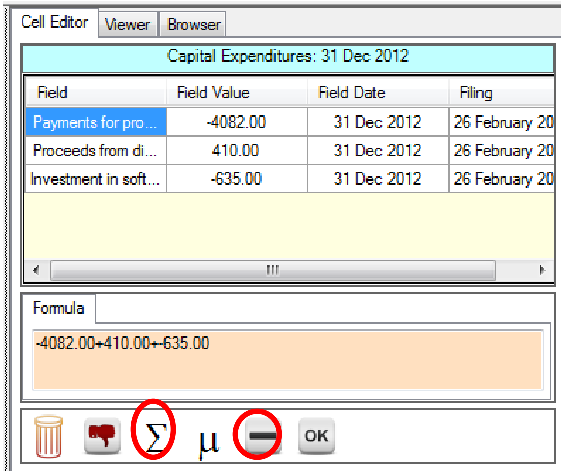
Plot	Line Item			
	Net cash provided by operating activities	19586	19846	19549
	Cash flows from investing activities			
	Payments for property, plant and equipment	-4082	-4108	-4185
	Proceeds from disposition of property, plant and equipment	410	608	770
	Investment in software	-635	-559	-569
	Purchases of marketable securities and other investments	-4109	-1594	-6129
	Proceeds from disposition of marketable securities and other investments	3142	3345	7877
	Non-operating finance receivables-net	-608	-291	-405
	Acquisition of businesses, net of cash acquired	-3722	-1811	-5922
	Divestiture of businesses, net of cash transferred	599	14	55
	Net cash used in investing activities	-9004	-4396	-8507

Items that are included in CAPEX:

i. Payments for property, plant and equipment.
ii. Proceeds from disposition of property, plant and equipment
iii. Investment in software

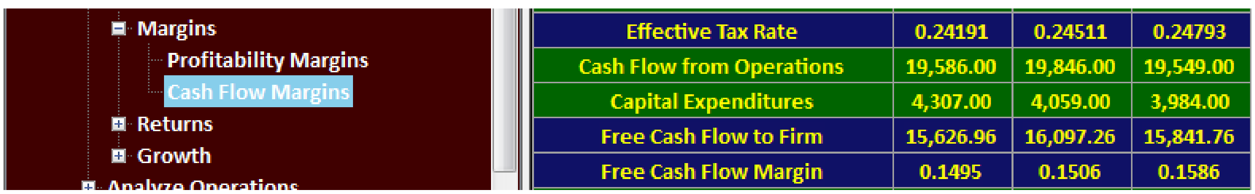
The remaining are not expenditures that maintain IBM's current capacity to generate goods and services. That is, investments in marketable securities are not part of IBM's primary business model. Similarly, Acquisition of businesses, net of cash transferred will likely influence future CAPEX but not current CAPEX. Adjustments for future CAPEX will be incorporated in growth assumptions and so we ignore these components. As a result, we can drag and drop these three items into the FSA Module.

The cell editor is then used to sum these items and create the formula for the remaining years (click on the summation icon circled below):



Important Note:

IBM has reported CAPEX as a negative amount and therefore the sign needs to be changed for the FSA Module's calculator because CAPEX is subtracted away from Cash Flows from Operations. Therefore you also need to click on the second circled "-" icon to change signs. Combined this then computes the CAPEX number for 2012 as a positive number. Finally give focus to the cell Sales in 2011 and then click on the circled icon above and repeat for 2010 to automatically compute CAPEX for the three years:



Effective Tax Rate	0.24191	0.24511	0.24793
Cash Flow from Operations	19,586.00	19,846.00	19,549.00
Capital Expenditures	4,307.00	4,059.00	3,984.00
Free Cash Flow to Firm	15,626.96	16,097.26	15,841.76
Free Cash Flow Margin	0.1495	0.1506	0.1586

Combined now you have computed your estimate for FCFF for IBM over three years and you can see that IBM's free cash flow margin has remained relatively stable over the last three years although the Free Cash Flow Margin is exhibiting a slight negative trend.

Reconciliation with IBM's Management

Our estimate is a little lower than IBM management's estimated FCFF which is provided in the table below:

IBM

Select Stock: INTERNATIONAL BUSINESS MACHINES CORP (IBM)

Filing Date: 26 February 2013 10-K

Select Statement: Consolidated Statement of Cash Flows (USD $)

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INTERNATIONAL BUSINESS MACHINES CORP (IBM) 26 February 2013 10-K

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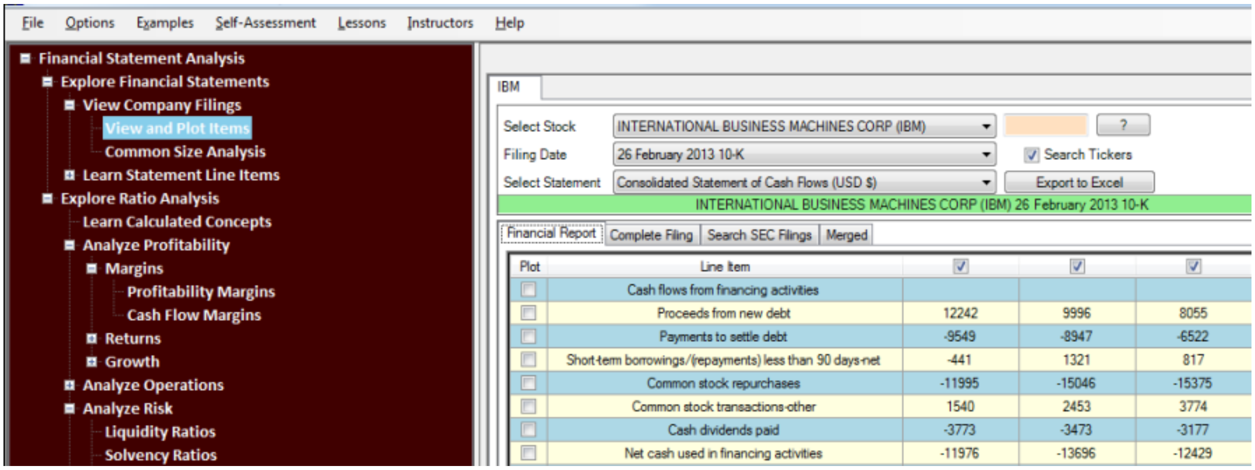
For the year ended December 31:	2012	2011	2010	2009	2008
Net cash from operating activities per GAAP	$ 19.6	$ 19.8	$ 19.5	$ 20.8	$ 18.8
Less: the change in Global Financing receivables	(2.9)	(0.8)	(0.7)	1.9	(0.0)
Net cash from operating activities, excluding Global Financing receivables	22.5	20.7	20.3	18.9	18.8
Capital expenditures, net	(4.3)	(4.1)	(4.0)	(3.7)	(4.5)
Free cash flow	18.2	16.6	16.3	15.1	14.3
Acquisitions	(3.7)	(1.8)	(5.9)	(1.2)	(6.3)
Divestitures	0.6	0.0	0.1	0.4	0.1
Share repurchase	(12.0)	(15.0)	(15.4)	(7.4)	(10.6)
Dividends	(3.8)	(3.5)	(3.2)	(2.9)	(2.6)
Non-Global Financing debt	0.7	1.7	2.3	(4.7)	(3.2)
Other (includes Global Financing receivables and Global Financing debt)	(0.8)	2.3	3.5	1.7	5.0
Change in cash, cash equivalents and short-term marketable securities	$ (0.8)	$ 0.3	$ (2.3)	$ 1.1	$ (3.2)

The difference is due to the Add back of the change in Global Financing receivables. This is a working capital item that IBM's management highlight as being part of their business strategy which is to also generate revenue from financing their clients. That is, IBM is following a non-traditional working capital management cycle in the sense that they have a long cash conversion cycle because it includes generating revenue (and presumably higher sales revenue) by financing their accounts receivables.

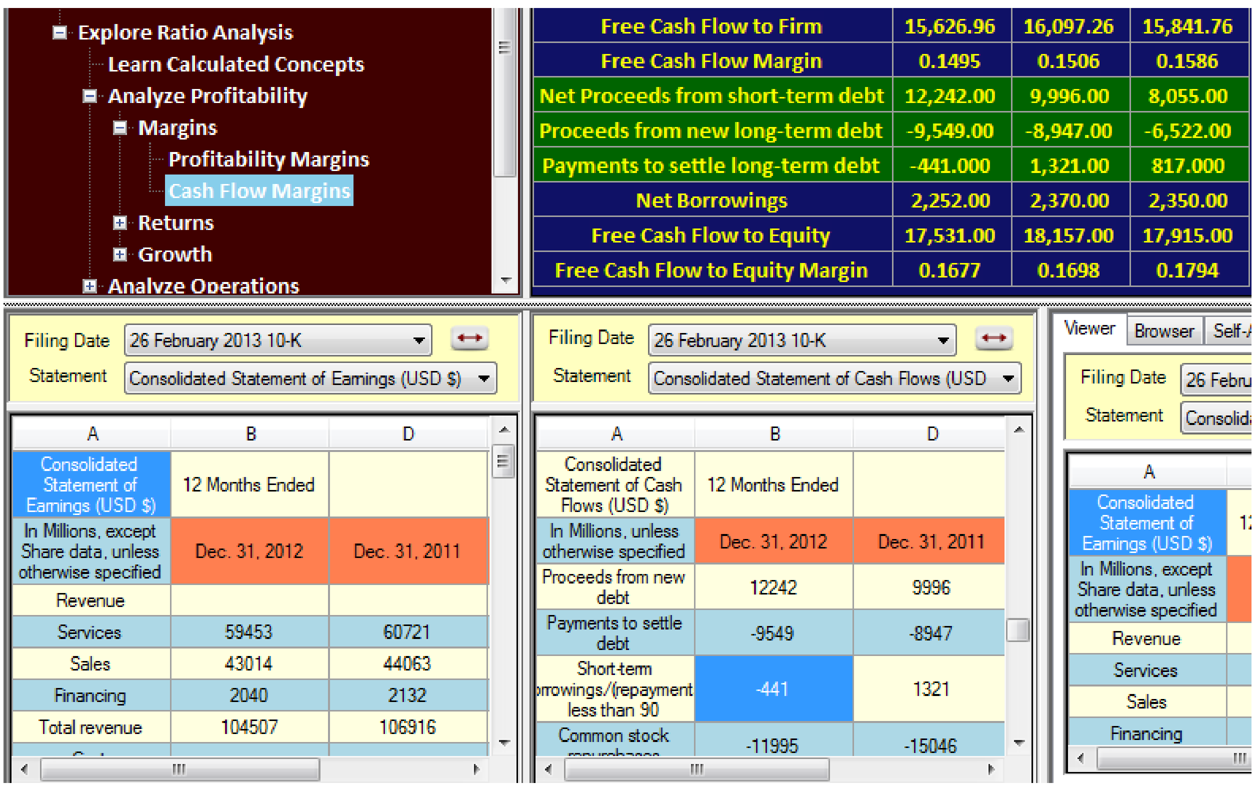
The main take away is that a good analyst is required to apply professional judgment when estimating FCFF. For valuation purposes we usually prefer to err on the side of conservative numbers and so we will work with the more conservative $15.6 billion free cash flow number.

Example Computing FCFE for IBM

Recall the difference between FCFF and FCFE is to adjust for the amount of CAPEX expenditure that is supported by debt holders. You look to the Cash Flow from Financing Activities on the cash flow statement to get this adjustment:



The net cash from debt financing activities is the sum of the first three items in the cash flow from financing activities.



Collecting together we will work out FCFE per share in Excel:

The Issued shares and Treasury stock information come from IBM's Consolidated Balance Sheet for the 2012 year files in 2013 and the 2011 year fled in 2012.

IBM	31-Dec-12	31-Dec-11	31-Dec-10
FCFE	17,531.00	18,157.00	17,915.00
Issued Shares	2,197,561,159	2,182,469,838	2,161,800,054

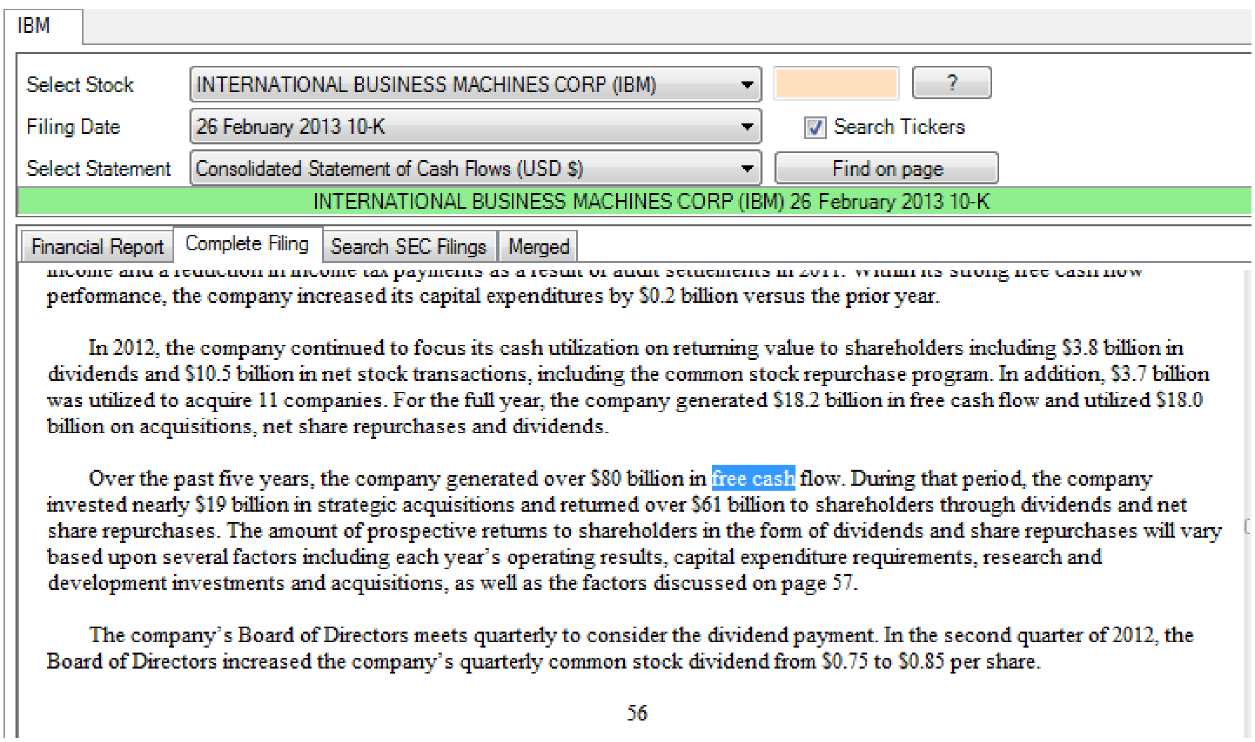
Treasury Stock	1,080,193,483	1,019,287,274	933,806,510
Net Shares Outstanding	1,117,367,676	1,163,182,564	1,227,993,544
FCFE Per Share	15.68955356	15.60975943	14.58883891

Immediate Observations:

IBM has been growing its FCFE per share and this number is much greater than IBM's dividend per share which implies that IBM's projected intrinsic value using this approach is much greater than the traditional dividend growth model would suggest.

You can recall, however, that the traditional model uses cash dividends whereas from the above FCFE is the estimate of IBM's ability to pay a dividend. Second, IBM's Treasury stock acquisitions made each year should really be computed as part of IBM's dividend paid – why?

The answer to why is that $1 is $1! That is, ignoring taxes $1 of Treasury stock is equal to $1 of cash dividend and so this is a common alternative way of paying dividends is to re-purchase existing stock. In fact IBM's management state explicitly that this indeed is part of their dividend policy:



income and a reduction in income tax payments as a result of audit settlements in 2011. Within its strong free cash flow performance, the company increased its capital expenditures by $0.2 billion versus the prior year.

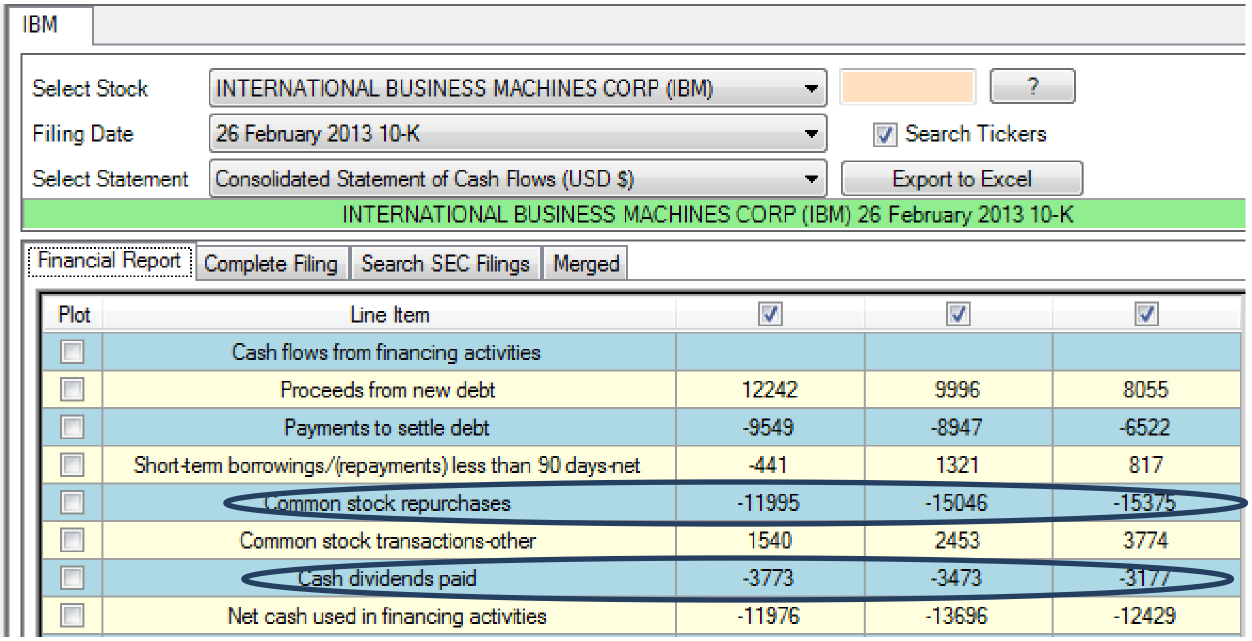
In 2012, the company continued to focus its cash utilization on returning value to shareholders including $3.8 billion in dividends and $10.5 billion in net stock transactions, including the common stock repurchase program. In addition, $3.7 billion was utilized to acquire 11 companies. For the full year, the company generated $18.2 billion in free cash flow and utilized $18.0 billion on acquisitions, net share repurchases and dividends.

Over the past five years, the company generated over $80 billion in free cash flow. During that period, the company invested nearly $19 billion in strategic acquisitions and returned over $61 billion to shareholders through dividends and net share repurchases. The amount of prospective returns to shareholders in the form of dividends and share repurchases will vary based upon several factors including each year's operating results, capital expenditure requirements, research and development investments and acquisitions, as well as the factors discussed on page 57.

The company's Board of Directors meets quarterly to consider the dividend payment. In the second quarter of 2012, the Board of Directors increased the company's quarterly common stock dividend from $0.75 to $0.85 per share.

56

Again you can consult the Cash Flow Statement for IBM's Treasury purchases:


IBM

Select Stock: INTERNATIONAL BUSINESS MACHINES CORP (IBM)

Filing Date: 26 February 2013 10-K

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INTERNATIONAL BUSINESS MACHINES CORP (IBM) 26 February 2013 10-K

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Plot	Line Item			
	Cash flows from financing activities			
	Proceeds from new debt	12242	9996	8055
	Payments to settle debt	-9549	-8947	-6522
	Short-term borrowings/(repayments) less than 90 days-net	-441	1321	817
	Common stock repurchases	-11995	-15046	-15375
	Common stock transactions-other	1540	2453	3774
	Cash dividends paid	-3773	-3473	-3177
	Net cash used in financing activities	-11976	-13696	-12429

That is, in 2012 the real dividend from IBM was (11,995 + 3773 = 15,968) or $14.29 per share. You can see that for a well-managed company when cash dividends are viewed this way there is no longer any large discrepancy between cash dividends and FCFE.

When this broader view of dividends is adopted usually you will want to reduce the growth projections and for IBM suppose we assume just below economy wide growth at 4% then the constant dividend growth model would now assess IBM as a strong buy:

Intrinsic Value = 14.29/(0.0762 – 0.04) = $394.75 > Spot market price.

Estimating the Expected Return from IBM

Equivalently the above implies that the expected return is higher than the cost of equity capital (0.0762) would predict. That is, recall it is only when the intrinsic value equals the market price that the cost of equity capital equals the expected return. For the current IBM example this immediately implies that the expected return from IBM is greater than 0.0762 or 7.62%. So what is the implied expected return?

We will use Excel's solver to answer this question.

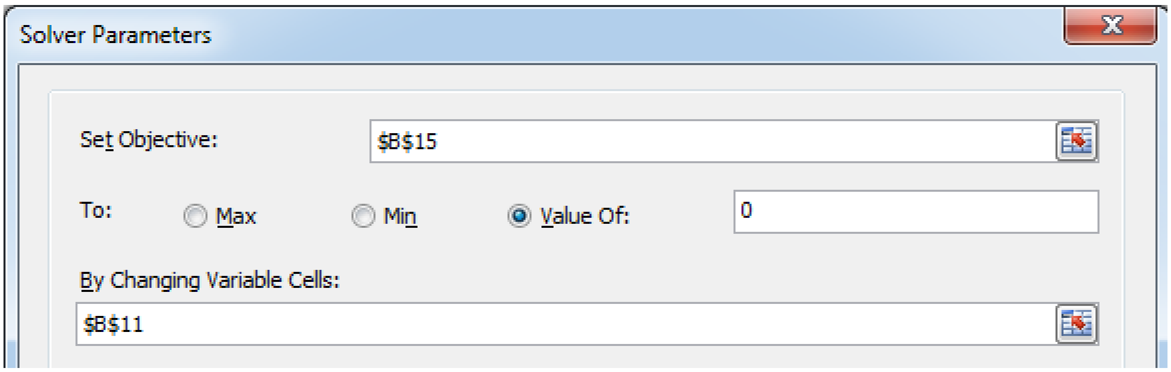
Solver Problem: What is the discount rate that equates the predicted intrinsic value to equal the spot market price?

The standard Constant Growth Model is provided in the first box below:

Predicted Intrinsic Value: Cost of Equity Capital	
Expected Dividend	14.29
Cost of Equity Capital	0.0762
Constant Dividend Growth	0.04

Calculated Value Intrinsic Value	394.7514
Spot Price	209.26

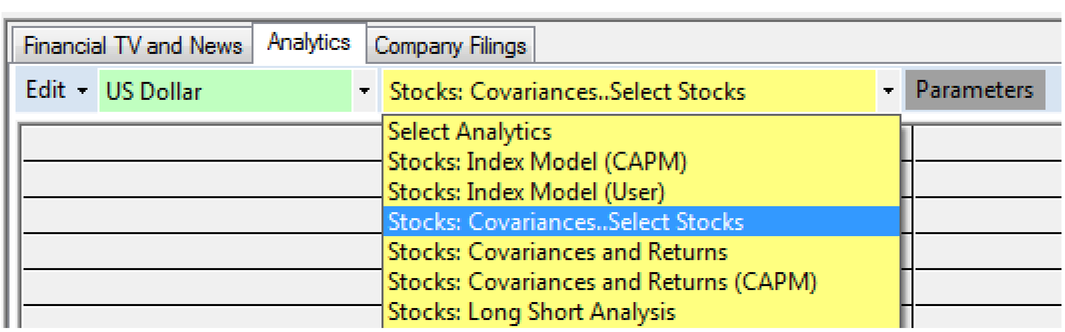
The solver problem is to change the cost of equity capital to find the value that equates intrinsic value to the spot market price. You can set this up in Excel as follows:



Solver Problem: Solving for the Expected Return	
Expected Dividend	14.29
Expected Return	0.108288
Constant Dividend Growth	0.04
Calculated Value Intrinsic Value	209.26
Spot Price	209.26
Intrinsic Value - Spot Price	-3.4E-07

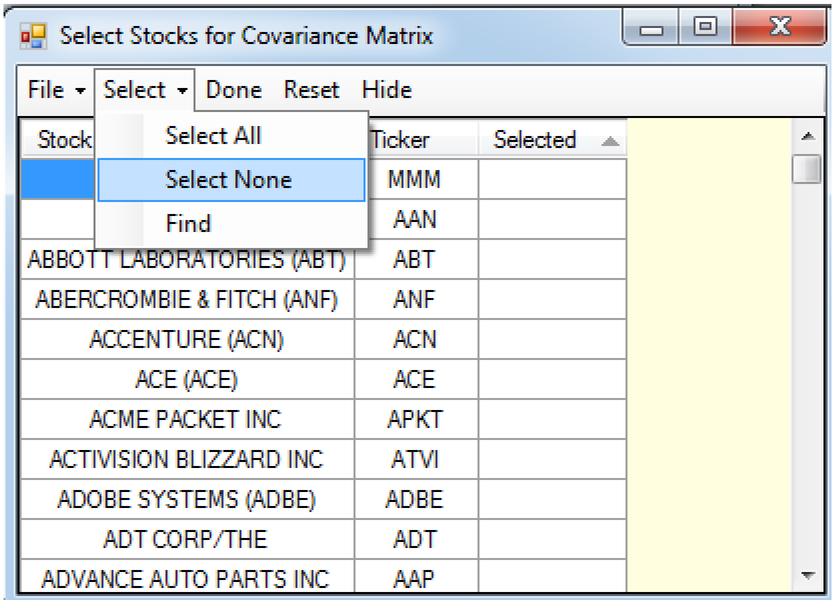
No wonder Warren Buffet was a buyer of IBM stock in 2012! There is a positive margin of safety and the implied expected return (conservatively estimated) is double digit (10.8%).

Final Step: Transferring the results of your analysis to the Portfolio Problem in the FTS 1000 Trading Exercise

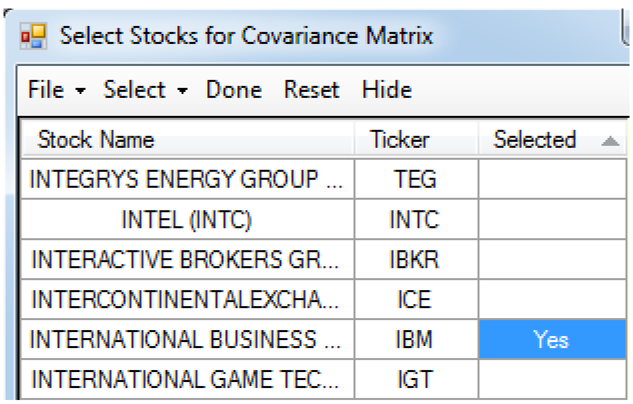


Select the highlighted "Stocks: Covariances…Select Stocks"

In the pop-up first turn off all stocks (Select None below) and then turn on the stocks of interest:



That is, you can select IBM by clicking in the "Selected" column as follows:



This then restricts RTFTS portfolio analytics to just the 8-16 selected stocks if you repeat for your other stocks. Finally, to enter your estimates of Expected Return complete the following steps:

Select the Parameters menu item.

Click on List All

Select International Business Machines from the drop down

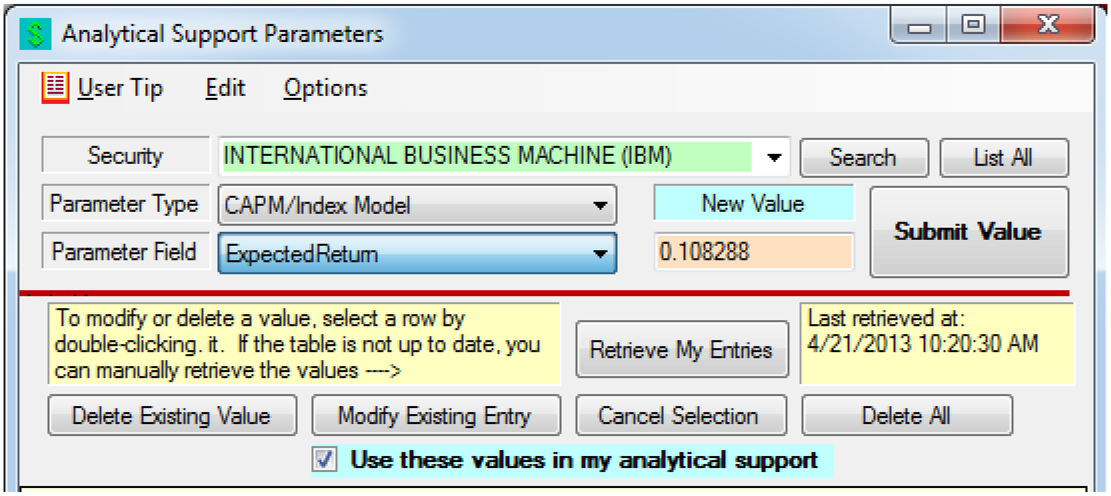
Select CAPM/Index Model

Select Expected Return and enter .108288 in the text box.

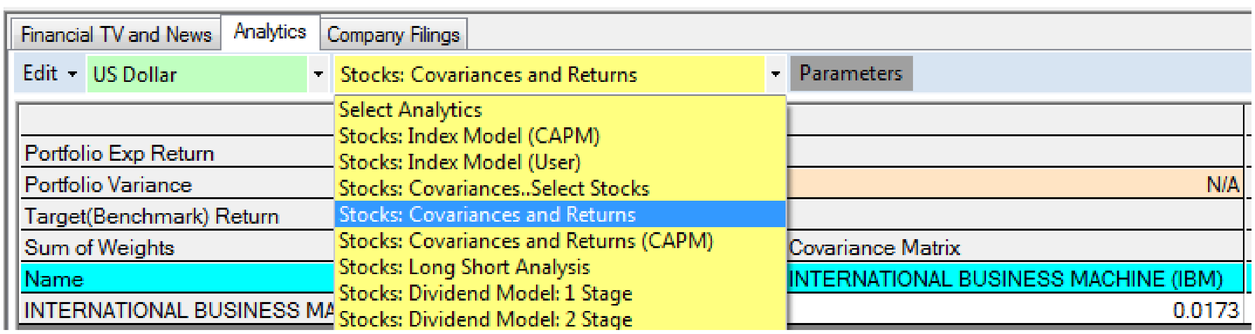
Check "Use these Values in My Analytical Support"

Click on the button Submit Value

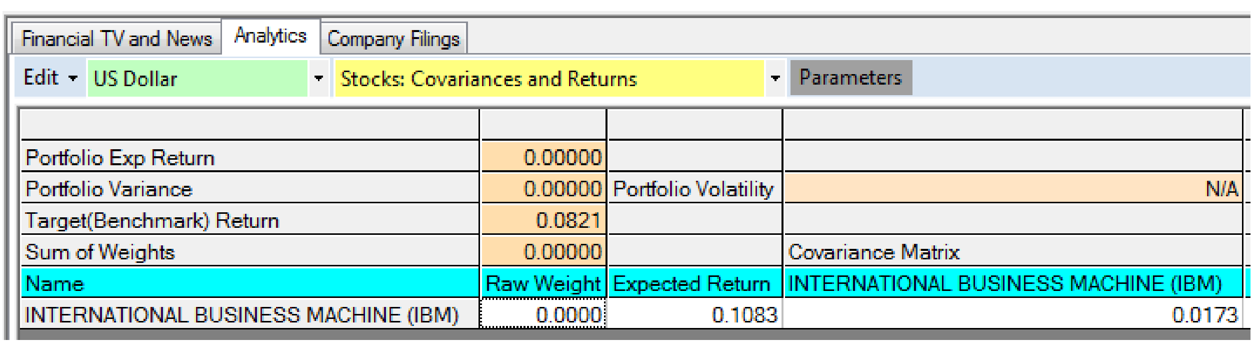
This is displayed as follows:



Once you have entered the expected returns for each of your stocks then select "Stock Covariances and Returns" as highlighted below:



And your expected return for IBM is now part of your analytical support.



RTFTS will find your optimal portfolio weights for the set of stocks you are working with.

Summary:

For the discounted cash flow method illustrated in this project you have stepped through the entire process associated with forecasting Expected Return and then using these forecasts in a single index model to identify the optimal portfolio weights using the constant dividend growth model. In addition, you have learned how to complete this starting with the Russell 1000 stocks or equivalent set of stocks if using one of the FTS foreign stock cases. There are three main phases to this analysis:

Phase 1: Planning

1. Plan using the FTS FSA Module and the RTFTS Heat Maps
2. Analysis and assessment of expected returns using the FSA Module and Excel

Phase 2: Implementation

3. Implementation of your portfolio and analysis using the RTFTS Beat the Market performance report

Phase 3: Results

4. RTFTS position manager provides the comprehensive report support for this project.

Default grading is based upon this report's evaluation of your team relative to the S&P500 index and relative to the class as a whole.