



## FTS Real Time Project: Understanding Financial Risk

**Question: What is the relationship between (fundamental) financial risk and beta?**

The financial risk a company faces results from its financing decisions, for example, whether it chooses to borrow to finance its investments or its operations. One way to measure financial risk is through *activity analysis*, specifically focusing on the sensitivity of financing activities on profits. In this project, we focus on understanding the *Degree of Financial Leverage*, defined below, as a measure of risk. This project is a companion to the previous project that worked with operational risk using the Degree of Operating Leverage (DOL) from Activity Analysis.

A different measure of risk, beta, which we explored in another project, is based on stock returns. It measures the sensitivity of a stock's return to the market as a whole. In its pure form, it does not pay attention to fundamentals. However, people have developed the concept of a "fundamental beta" which takes into account information such as operating and financial risk. One argument in favor of this approach is that beta typically is calculated using historical data, while fundamentals provide information about the future performance of a firm. Perhaps the most famous example of a fundamental beta is BARRA's Predicted Beta

<http://admin.epiq11.com/onlinedocuments/trb/exhibits/dcl%20exhibits/D1148.pdf>

### Financial Risk

We consider financial risk estimated from a firm's fundamentals. There are two popular approaches adopted in practice. Both approaches share the objective of measuring financial leverage but one adopts a balance sheet (i.e., stock approach) to the problem and the other adopts an income statement (i.e., flow approach) to the problem. The *stock approach* estimates financial leverage directly from the debt to equity ratio and the *flow approach* estimates financial leverage as an elasticity relative to Earnings Before Interest and Taxes (EBIT). This latter approach is referred to as Activity Analysis. In this project we apply the flow approach.

Financial risk in "Activity Analysis" is measured by the "Degree of Financial Leverage." The ideas underlying this measure can be developed as follows. From the firm's financial statements we can first estimate a firm's Earnings Before Interest and Taxes (EBIT) which provides a measure of the operating performance for a firm. Similarly, if we subtract away Net Interest Expense from EBIT then this yields

Earnings Before Taxes (EBT). However, interest expense is tax deductible and thus what is important for financial decisions in the real world is *after-tax interest expense*. As a result, in practice the Degree of Financial Leverage (DFL) is defined and measured in terms of Earnings per share. That is, the usual definition is:

$$\text{Degree of Financial Leverage (DFL)} = \% \text{ Change in EPS} / \% \text{ Change in EBIT}$$

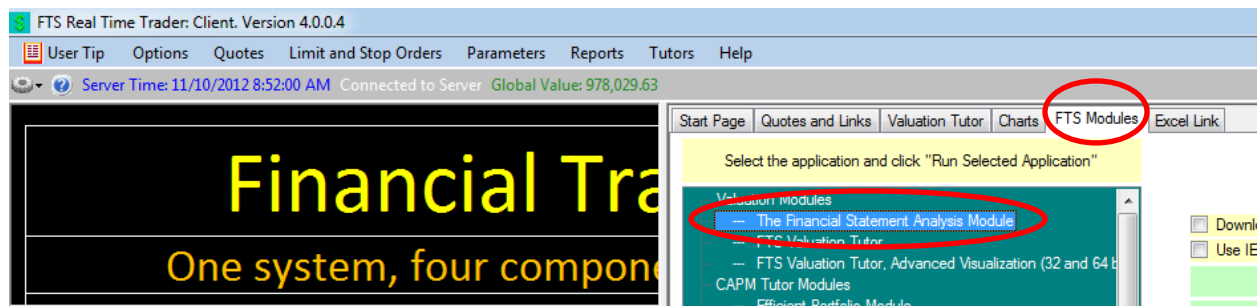
This definition has the additional nice practical property that it is in a form that provides an immediate linkage from Sales Revenue forecasts to analyst earnings' forecasts via the degree of total leverage. This is defined as follows:

$$\text{Degree of Total Leverage (DTL)} = \% \text{ Change in EPS} / \% \text{ Change in Sales} = \text{DFL} * \text{DOL}$$

In the above the DOL is the Degree of Operating Leverage which was introduced in the previous project in this series.

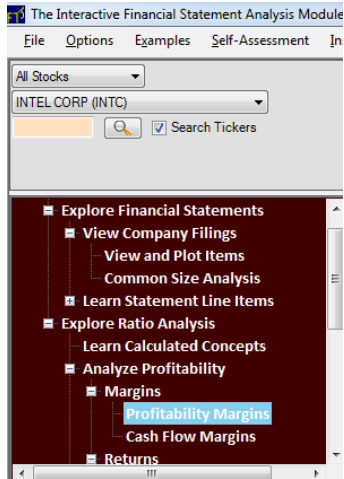
### Example: Estimating the DFL for INTC and WMT using the Interactive Financial Statement Analysis (IFSA) module.

**Step 1:** Launch the Interactive Financial Statement Analysis Module from within the FTS Real Time Client:



**Step 2:**

Select Intel and click on Profitability Margin as displayed below:



Step 3: Select Intel's latest 10-K and drag and drop the required accounting numbers into the calculator. You will first select the latest 10-K and Consolidated Statement of Income as Indicated below:

The Interactive Financial Statement Analysis Module: INTEL CORP

File Options Examples Self-Assessment Instructors Help

All Stocks  
INTEL CORP (INTC)  
Search Tickers

Common Size Analysis  
 Learn Statement Line Items  
 Cash Flow Statement  
 Explore Ratio Analysis  
 Learn Calculated Concepts  
 Analyze Profitability  
 Margins  
 Profitability Margins  
 Cash Flow Margins  
 Returns  
 Growth

| INTC                     | 31 Dec 2011 | 25 Dec 2010 | 26 Dec 2009 |
|--------------------------|-------------|-------------|-------------|
| Sales                    | 53,999.00   | 43,623.00   | 35,127.00   |
| Cost of Sales            | 20,242.00   | 15,132.00   | 15,566.00   |
| Gross Margin             | 33,757.00   | 28,491.00   | 19,561.00   |
| SG&A                     | 7,670.00    | 6,309.00    | 7,931.00    |
| R&D                      | 8,350.00    | 6,576.00    | 5,653.00    |
| Lease Expense            | 0.00000     | 0.00000     | 0.00000     |
| Other Operating Expenses | 260.0000    | 18.00000    | 266.0000    |
| EBIT                     | 17,477.00   | 15,588.00   | 5,711.00    |
| Interest Expense         | 0.00000     | 0.00000     | 0.00000     |
| Interest Revenue         | 103.00000   | 100.00000   | 163.00000   |

Filing Date: 23 February 2012 10-K  
Statement: Consolidated Statements of Income (USD \$)

| A  | B               | C             | D             |
|--|-----------------|---------------|---------------|
| Consolidated Statements of Income (USD \$)                     | 12 Months Ended |               |               |
| In Millions, except Per Share data, unless otherwise specified | Dec. 31, 2011   | Dec. 25, 2010 | Dec. 26, 2009 |
| Net revenue  | 53999           | 43623         | 35127         |
| Cost of sales  | 20242           | 15132         | 15566         |
| Gross margin   | 33757           | 28491         | 19561         |
| Research and development                                       | 8350            | 6576          | 5653          |
| Marketing, general and administrative                          | 7670            | 6309          | 7931          |

Filing Date: 31 October  
Statement: Consolidated Conder

| A  | B              |
|--|----------------|
| Consolidated Condensed Statements of Income (USD \$)           | 3 Months Ended |
| In Millions, except Per Share data, unless otherwise specified | Sep. 29, 2012  |
| Net revenue  | 13457          |
| Cost of sales  | 4942           |
| Gross margin   | 8515           |
| Research and development                                       | 2605           |

In the above screen first drag and drop the three Date Headers (Dec 31, 2011; Dec 25, 2010; and Dec 26, 2009) to create the three date headers in the calculator.

The green cells are input fields and the blue cells are derived for you by the calculator. There are a few tricks you will learn to perform but one in particular is to drag and drop the accounting numbers into the first column 31 Dec 2011 and then clicking inside the second column (i.e., the Sales cell to give it focus) and then clicking on the arrow icon (circled above). This automatically gets the second year's data for you from the statement and you can then repeat this for year 3.

**Step 4:** Now you have three years of Sales and EBIT information and so you can calculate the EBIT growth as follows:

Instructors Help

|                          | Mean      | Volatility    | Intercept | Slope    | Growth   |
|--------------------------|-----------|---------------|-----------|----------|----------|
| Sales                    | 44,249.67 | 59,555,086.22 | 34,813.67 | 9,436.00 | 0.21500  |
| Cost of Sales            | 16,980.00 | 5,351,714.67  | 14,642.00 | 2,338.00 | 0.13134  |
| Gross Margin             | 27,269.67 | 34,333,563.56 | 20,171.67 | 7,098.00 | 0.27283  |
| SG&A                     | 7,303.33  | 505,702.89    | 7,433.83  | -130.50  | -0.01673 |
| R&D                      | 6,859.67  | 1,252,534.89  | 5,511.17  | 1,348.00 | 0.19504  |
| Lease Expense            | 0.00      | 0.00          | 0.00      | 0.00     | NaN      |
| Other Operating Expenses | 181.33    | 13,344.89     | 184.33    | -3.00    | -0.01141 |
| EBIT                     | 12,925.33 | 26,618,022.89 | 7,042.33  | 5,883.00 | 0.55925  |
| Interest Expense         | 0.00      | 0.00          | 0.00      | 0.00     | NaN      |
| Interest Revenue         | 154.67    | 1,182.89      | 140.17    | 14.50    | 0.0818   |
| Net Interest Expense     | -154.67   | 1,182.89      | -140.17   | -14.50   | NaN      |

The above screen is the calculator screen completed in step 4 and by further clicking on the Statistics tab above you get the Growth estimate for each line item. From the above screen EBIT growth is 0.55925:

EBIT Growth Intel = 0.55925

You can equivalently calculate WMT as follows:

|                          | Mean       | Volatility     | Intercept  | Slope     | Growth   |
|--------------------------|------------|----------------|------------|-----------|----------|
| Sales                    | 425,628.00 | 258,888,458.00 | 406,195.50 | 19,432.50 | 0.04549  |
| Cost of Sales            | 318,059.67 | 165,231,200.22 | 302,549.17 | 15,510.00 | 0.04857  |
| Gross Margin             | 107,568.33 | 10,476,056.89  | 103,646.33 | 3,922.00  | 0.03636  |
| SG&A                     | 82,201.00  | 5,013,290.67   | 79,557.00  | 2,644.00  | 0.03201  |
| R&D                      | 0.00       | 0.00           | 0.00       | 0.00      | NaN      |
| Lease Expense            | 0.00       | 0.00           | 0.00       | 0.00      | NaN      |
| Other Operating Expenses | 0.00       | 0.00           | 0.00       | 0.00      | NaN      |
| EBIT                     | 25,367.33  | 1,104,110.22   | 24,089.33  | 1,278.00  | 0.05060  |
| Interest Expense         | 2,197.33   | 11,037.56      | 2,068.83   | 128.50    | 0.05865  |
| Interest Revenue         | 181.33     | 253.56         | 190.83     | -9.50     | -0.05543 |
| Net Interest Expense     | 2,016.00   | 12,768.00      | 1,878.00   | 138.00    | 0.05836  |

Wal-Mart's EBIT growth is:

EBIT Growth WMT = 0.0506

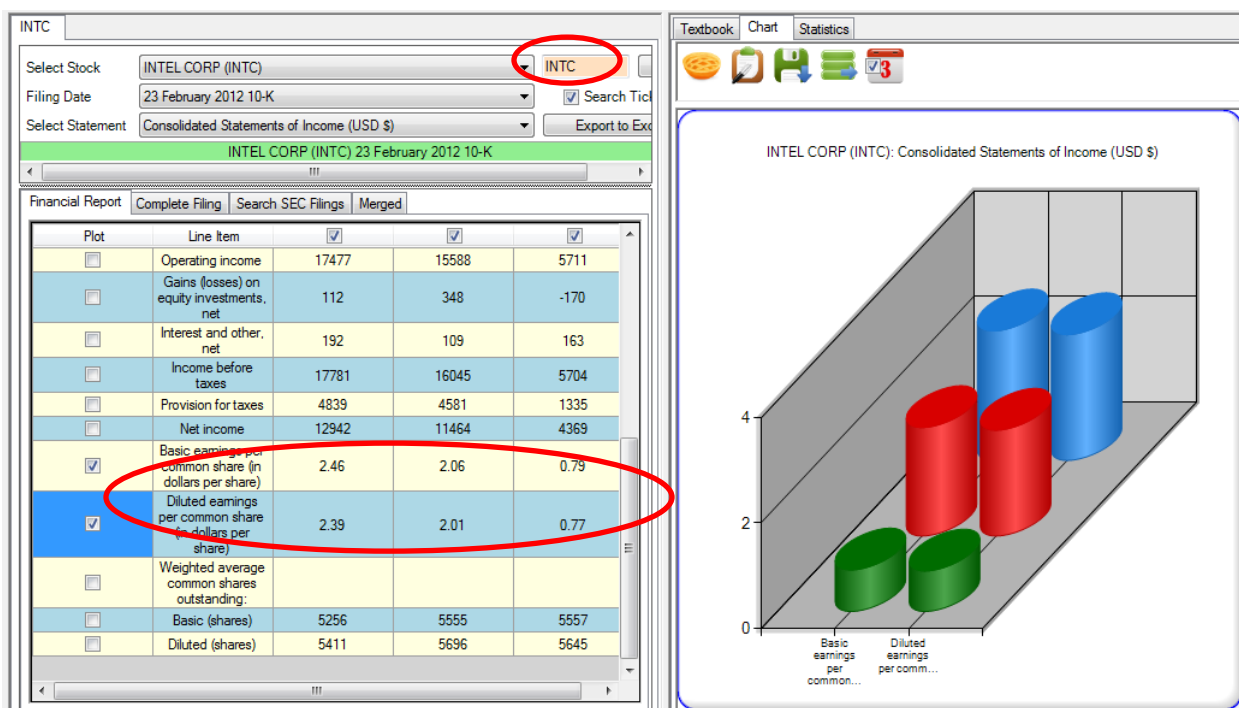
What is the growth in EPS?

The accountants provide a measure of Earnings per Share which is required as part of a stock's 10-K submission to the SEC. The IFSA module provides immediate access to this information in a form that is relevant for Activity Analysis by following the steps provided.

**Step 1:** Working within the IFSA module select branch "View and Plot Items" from the tree as follows:



Step 2: Enter the ticker for Intel and select the Income Statement from the latest 10-K filing:



The above reveals that there two values reported for EPS in an Income Statement. The second one is the Diluted EPS which is computed assuming that any compensation options outstanding for management and employees are exercised if in the money. This dilutes the number of shares outstanding and thus provides a lower bound estimate for EPS. In this project we will use the “Diluted EPS.”

In the above screen click on the “Statistics” tab just above the chart to get the Growth estimate for EPS. If only the two EPS numbers are being plotted (see the checkbox beside the circled values above) then the Statistics tab provides the following results:

|                              | Mean | Volatility | Intercept | Slope | Growth  |
|------------------------------|------|------------|-----------|-------|---------|
| Basic earnings per common... | 1.77 | 0.51       | 0.10      | 0.84  | 0.56794 |
| Diluted earnings per comm... | 1.72 | 0.48       | 0.10      | 0.81  | 0.56633 |

Collecting the above together we have:

EBIT Growth Intel = 0.55925

EPS Growth Intel = 0.56633

DFL Intel =  $0.56633 / 0.55925 = 1.01266$

Similarly, for WMT this is:

|                              | Mean | Volatility | Intercept | Slope | Growth  |
|------------------------------|------|------------|-----------|-------|---------|
| Diluted income per common... | 4.15 | 0.11       | 3.34      | 0.40  | 0.09826 |
| Diluted net income per co... | 4.23 | 0.14       | 3.42      | 0.40  | 0.09874 |

| Plot                                | Line Item   |       |      |       |
|-------------------------------------|---|-------|------|-------|
| <input checked="" type="checkbox"/> | Diluted income per common share from continuing operations attributable to Walmart          | 4.54  | 4.18 | 3.73  |
| <input type="checkbox"/>            | Diluted income (loss) per common share from discontinued operations attributable to Walmart | -0.02 | 0.29 | -0.02 |
| <input checked="" type="checkbox"/> | Diluted net income per common share attributable to Walmart                                 | 4.52  | 4.47 | 3.71  |

Again collecting terms:

EBIT Growth WMT = 0.0506

EPS Growth WMT (Continuing Operations) = 0.09826

DFL WMT =  $0.09826 / 0.0506 = 1.941897$

That is, WMT has greater after tax financial leverage than Intel measured relative to the after tax net interest expense paid by each company.

The project can be conducted using any of the FTS Stock Cases. From the stocks in the case, you are to work with between 12 and 20 stocks in a 2X2 Factor position. Factor 1 is low DFL versus high DFL and Factor 2 is low stock beta versus high stock beta.

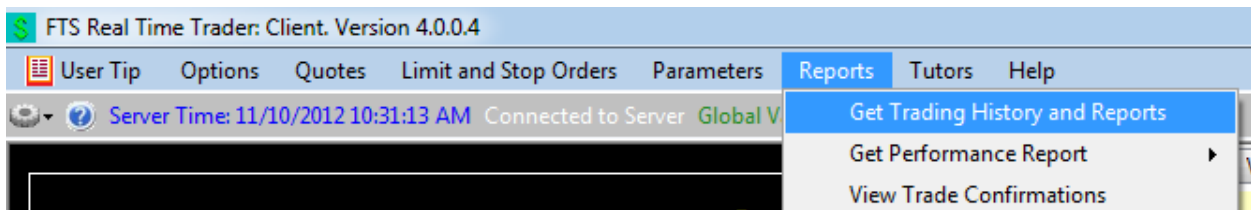
## Portfolio Components

|                              |                               |
|------------------------------|-------------------------------|
| <b>Low DFL<br/>Low Beta</b>  | <b>High DFL<br/>Low Beta</b>  |
| <b>Low DFL<br/>High Beta</b> | <b>High DFL<br/>High Beta</b> |

For a subset of 12 to 20 stocks belonging to the trading case (see the ticker window for the stock list) compute the DFL and look up the beta for each stock in the analytical support provided in RTFTS or from your own research. Rank your stocks in terms of DFL and Beta and based upon these rankings identify between 3-5 stocks that you judge relative to each other satisfy the above criteria. That is, identify between 3-5 stocks that fall into the above cells. Keep the number of stocks equal, so that you have either 3 in each cell, 4 in each cell or 5 in each cell.

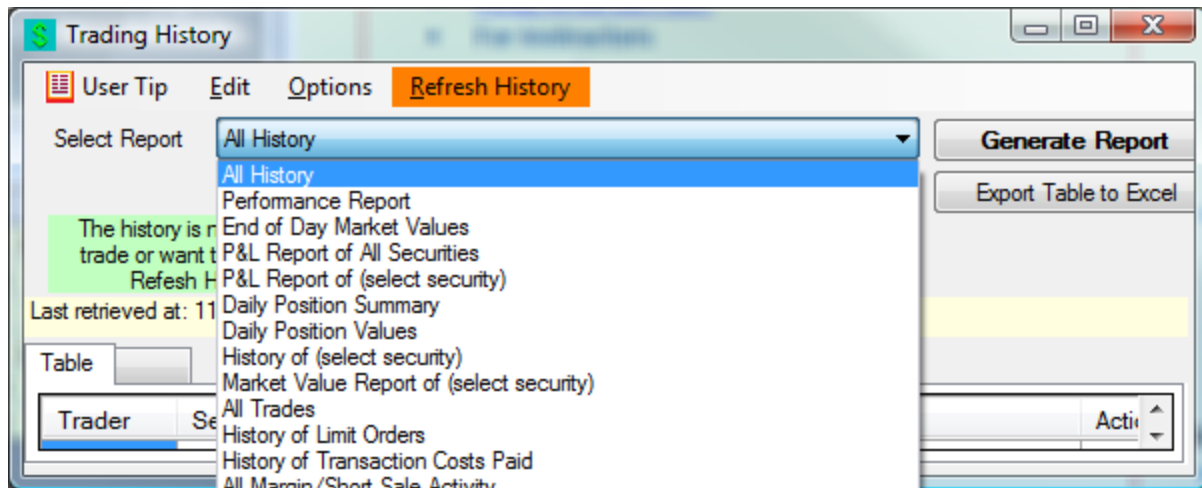
1. You have \$1 million in cash to invest an equal dollar amount in each stock. That is, if you select 5 stocks in each cell then allocate \$50,000 to purchase each stock. Also record the beta for each stock at this time.
2. Over time, as prices change, each cell will perform differently in terms of realized returns. At the end of the allocated time period record how the S&P500 index has changed plus how each stock has performed along various portfolio performance criteria.

For this part you should use the reports menu item in RTFTS as follows:



At any time you can check your performance against the performance of others or other teams by selecting Get Performance Report. However for analysis purposes you need to select Get Trading History and Reports as highlighted. This brings up the following screen:





You can bring in any report and export it to Excel. In particular you will want to examine the P&L Report of your securities. Particularly useful is the report “Daily Position Values” which tells you the market value of each of your holdings at the end of each day. This helps you calculate the performance of the stocks in each cell.

3. Answer the following questions:

- Calculate the average beta for the stocks in each cell.
- Calculate the average DFL for the stocks in each cell.
- Rank betas for all of your stocks from low to high and graph the ranked betas against DFL. Discuss the nature including how strong or weak any relationship you observe between the two measures of risk (DFL and Beta) is.
- Risk and Returns: Compute the market returns for each portfolio in the sub cells plus the return on the S&P500 index over this same period of time. How is each cell related to the returns from the S&P500? Which cells changed the most and the least? Is this consistent with what you would hypothesize for this 2-factorial set of stocks based upon DFL and Beta?
- Bottom Line: What predicted returns over your trading period better, beta measured from returns or DFL measured from fundamentals? Provide a brief discussion of your findings.