Analytics mindset

Implementing the DuPont Method

Background:

A key purpose of financial statements is to provide useful information to decision makers, including investors. Investors can use the information contained in financial statements to better understand company performance so they can make better investment decisions. One introductory framework that has been especially useful in understanding company performance is the DuPont Method (sometimes called DuPont Analysis, DuPont Model or DuPont Framework). To understand the DuPont Method, it helps to use an analytics mindset. For this case, we (1) define an analytics mindset, (2) discuss the history of and ratios involved in the DuPont Method and (3) use the DuPont Method to perform data analytics and data visualization techniques.

Implementing an analytics mindset

Having and using an analytics mindset is critical in accounting and business. This case focuses on developing all aspects of your analytics mindset. As a review, an analytics mindset is the ability to:

- Ask the right questions.
- Extract, transform and load relevant data into a data analysis tool.
- Apply appropriate data analytic techniques.
- Interpret and share the results with stakeholders.

History and model

The DuPont Method has an interesting history. E. I. du Pont de Nemours and Company, or more frequently called DuPont, is the oldest stock in the current Dow Jones Industrial Index. Started in July 1802, the company originally focused on producing gunpowder. Today, the company makes chemicals which are in everything from food ingredients and dietary supplements to pharmaceuticals and fabrics. In addition to developing chemicals, the company has been a pioneer with respect to management accounting systems. The company developed the original accounting ratio of return on equity (ROE) and then in 1912, Donaldson Brown decomposed ROE into additional ratios. ROE measures a company's profitability as a percentage of shareholder's equity (i.e., how profitable a company can be using shareholders' investments.) If ROE is unsatisfactory, the DuPont analysis can identify the aspect of the business that is underperforming. DuPont used this formula for managing its business. In 1914 DuPont invested in General Motors, and using the same basic management accounting formulas, led that company to become the world's largest automobile company. In 1957, DuPont divested its ownership in General Motors because of antitrust laws. After having been highly useful for both General Motors and DuPont, the basic DuPont Method has been extended and used by many to understand investing and managing businesses.

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The DuPont Method has evolved into the following formula:

Return on equity = Profit margin ratio * asset turnover ratio * financial leverage ratio

This can be written as follows:

$$\frac{\text{Net Income}}{\text{Shareholders' Equity}} = \frac{\text{Net Income}}{\text{Sales}} * \frac{\text{Sales}}{\text{Total Assets}} * \frac{\text{Total Assets}}{\text{Shareholders' Equity}}$$

Return on equity: This represents the amount of net income that is generated for each dollar of shareholder's equity. It can be interpreted as the amount of net income generated for each dollar of value that a shareholder owns of the company. This number can be either negative or positive.

Profit margin ratio: This represents the amount of net income that is generated for each dollar of sales. It can be interpreted as the percentage of each dollar of sales that the company retains as earnings. Since net income can be negative, this ratio can be either negative or positive.

Asset turnover ratio: This represents the amount of sales that is generated for each dollar of assets the company owns. This is often interpreted as the efficiency of the company—how many sales it can generate given the assets it owns. Except in very unusual circumstances, this ratio is positive.

Financial leverage ratio: This represents the amount of assets that is financed by shareholders, as opposed to debt holders. Except in very unusual circumstances, this ratio is positive.

Case overview

For this case, you will implement an analytics mindset by comparing and contrasting different companies within different industries using the accounting ratios from the DuPont method. In Part I of the case, you will gain an understanding of a few accounting ratios, which will help you to develop the right questions about the companies you are analyzing. In Part II, you will load the data into Tableau and perform some simple tests to verify that you have loaded it correctly. In Part III, you will analyze the data. Finally, in Part IV, you will leverage the power of data visualization to present the data so that it can be easily interpreted.

Data

In the accompanying spreadsheet (Analytics_mindset_case_studies_DuPont.xls), you have financial statement data for approximately 30 companies for each of six different industry groups (total sample size of almost 180 companies). The sheets contain financial statement information for fiscal years 2013-2015, inclusive. These companies are all publicly traded on the NASDAQ stock exchange and range in size from some of the largest to the smallest in their respective industry groupings.

For this case, you will not be using all data items. The items you are most likely to use are listed by the name they appear in the spreadsheet with a small explanation also provided.

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- Industry: One of six industry groupings as defined by Nasdaq.com.[1] Industries included in the sample are capital goods, consumer services, finance, public utilities, technology, and transportation.
- Name: The name of the company for each line of data.
- Net income: The bottom line number on the income statement. This is the final net income number of the company for the fiscal year.
- Net revenue: The top line number on the income statement. This represents total revenues (less a few items that you can ignore for this case) earned by the company in the fiscal year. This is also referred to as total sales.
- Ticker: The code used to identify each company on the NASDAQ stock exchange. Each company has their own unique ticker symbol.
- Total assets: The total assets of a company at the end of the fiscal year. This number appears on the balance sheet.
- Total shareholder equity: The total shareholder equity of a company at the end of the fiscal year. This number appears on the balance sheet and also can be called stockholder's equity.
- Year: The fiscal year being reported on the financial statements. For example, a year of 2015, means the balance sheet of the company is as of the last day of their fiscal year in 2015 (usually December 31st) and the income statement for all transactions that occurred during the fiscal year.

[1] See http://www.nasdaq.com/screening/companies-by-industry.aspx for industry groupings.

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Part I: Ask the right questions

A significant portion of developing your analytical mindset happens before you analyze data. While you already have a fundamental understanding of the DuPont Method and are aware of the data elements available to you, you have not yet determined the best way to analyze the data to provide the most relevant insights. To gather the most relevant insights, you must start by asking the right questions of the data. In this section, you will first think through the DuPont Method in more detail so you understand some of the business context. From there, you will identify questions for the data that will provide insights to your stakeholder. Assume your stakeholder is an investor whose objective is to make some quality investments in the near future based on the performance of the companies in this data set. Your stakeholder is interested in both an industry recommendation and a company recommendation.

Required

1. Describe whether you want a high value or a low value for each ratio, independent of the other ratios.
   - Return on equity:
   - Profit margin ratio:
   - Asset turnover ratio:
   - Financial leverage ratio:
2. The profit margin ratio is the only ratio that makes up ROE that can be negative (except in relatively rare cases). Describe how the interpretation of the Asset Turnover Ratio and the Financial Leverage Ratio change based on whether the Profit Margin Ratio is positive or negative.
3. How can a company improve each ratio? Make sure to discuss how changes in either the numerator or denominator can improve the ratio. For each ratio, do you think it is "better" to focus on improving the numerator or denominator?
4. Before you analyze the data, it is helpful to develop an expectation of what you think you might see. What industry do you believe will have the highest and lowest values for the 2015 fiscal year for each item below? Why?
   - Return on equity
   - Profit margin ratio
   - Asset turnover ratio
   - Financial leverage ratio
5. What questions do you want to ask of the data? Think about relevant insights you want to gain for your stakeholder and identify at least five questions that you want to answer.

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Part II: Extract, transform and load the data (the ETL process)

The data for this case was extracted from company financial statements posted online from credible sources. The extraction of the data from the online sources was performed for you and the data has been loaded into the Excel file. That is, you can assume that the web scrapper accurately and completely extracted the information and loaded it into Excel. Most of the transformation work has been done for you as well. You will be required to do some transformation to analyze the data once it has been loaded into the appropriate analysis tool (e.g., you will need to compute the ratios involved in the DuPont Method).[2] You should load the data into an analytics tool for analysis—we will be using Tableau in this case.

Hint: when loading the data into Tableau, you need data from both the income statement and the balance sheet tabs. Make sure that you link the income and balance sheet data correctly by matching the data on *both* ticker symbol and year.

Required

When you are finished loading the data, you should answer these simple questions to make sure you loaded the data correctly (by testing for completeness and accuracy).

1. What are the combined total assets of all companies for all years?
2. How many different companies are listed in the dataset?
3. How many different companies are there in each industry?
   - Capital goods
   - Finance
   - Public utilities
   - Transportation
   - Consumer services
   - Technology
4. What are the total sales for each industry in 2013 (do not round your answers)?
   - Capital goods
   - Finance

[2] Realize for many situations, extracting, transforming, and loading (ETL) the data can account for over 80 percent of the time in the entire data analysis process. This case simplifies this process so you can focus on developing other aspects of an analytics mindset. Also, the process does not always strictly follow the ETL format. Some transformation can happen before or after data is loaded into a tool for analysis.

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- Public utilities
- Transportation
- Consumer tervices
- Technology

5. What company had the most sales over the three-year period and what was the total amount of those sales?

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Part III: Apply appropriate data analytic techniques

You are now ready to analyze the data. Previously, you identified five questions that you thought would provide relevant insights of the data. Before answering those questions, answer the questions that are listed below. For each question:

- Identify the type of the analysis to perform
- Identify which data elements are needed to perform the analysis
- Create the analysis using Tableau

Required

Questions about industries

1. Which industries for fiscal year 2015 are the highest and lowest performing for each of the following performance indicators? For measuring performance, use the *median* industry performance to control for the potentially large effects of outliers. Compare your answers to what you predicted in Part I. What did you predict correctly and where were you incorrect? Why do you think you were incorrect for some industries?

Item	Highest	Lowest
Return on equity		
Profit margin ratio		
Asset turnover ratio		
Financial leverage ratio		

2. Which industry has seen the greatest improvement in median ROE from 2013 to 2015? What are the best explanations, based on the ratios in the DuPont Method, for why the ROE has improved in that industry?

3. Assume you want to invest in one of the industries included in the dataset (i.e., buy stock in all companies in one industry). Which industries do you think will offer the highest and lowest return in 2016? Which industries will provide the safest and riskiest return in 2016? Does removing outliers change your opinion?

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Questions about individual companies

4. What companies have the best ROE within each industry for 2015? Sort the data so you can see the companies listed from highest to lowest ROE. What observations do you make about differences in ROE for the different companies?

5. Companies that have negative profit margins but are increasing their asset turnover ratio are "accelerating into a brick wall" (i.e., they are getting better at losing money). What three companies in 2015 are the worst in that they have a negative profit margin and the highest asset turnover ratio? Give the name of the company.

6. Create a dashboard that allows you to evaluate how a company's ratios change between 2014 and 2015. The dashboard should show the ratios for 2014 and 2015, the percentage change from one year to the next, and the percentage change for the company's industry. Choose three different companies and discuss what you learn about the company based on these metrics.

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Part IV: Interpret and share the results with stakeholders

Now that you have completed your analysis, for each question, interpret your analysis and prepare a presentation including a visual dashboard or graphic with a concise written analysis of your interpretation of the analytic results. When considering your visualization, make sure to think about what type of visualization will provide the clearest and most compelling format for stakeholders to understand what you want to convey.

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