

# Advancing the Interpretation of the Du Pont Equation

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The purpose of this paper is to advance the interpretation of the Du Pont Equation, which is commonly used in the financial statements analysis of corporations. The paper makes a special interpretation of the three terms which appear in the Du Pont Equation that provides an understanding of the overall financial standing of the corporation under consideration. As a result of this interpretation, the order in which financial statements analysis is commonly performed should be reversed. That is, in financial statements analysis, one should start with the analysis of the Du Pont Equation, to gain an overall understanding of the financial situation of the corporation; and then, perform the ratio analysis, to gain a detailed understanding of the financial situation of the corporation. This order of analysis is in contrast to the order in which financial statements analysis is commonly performed, i.e., first, the ratio analysis is performed, and then, the Du Pont Equation is analyzed.

*Keywords:* Du Pont Equation, financial analysis, ratio analysis

## Introduction

In financial statements analysis, it is common to start with the ratio analysis and then analyze the Du Pont Equation.<sup>1</sup> The purpose of this paper is to advance the interpretation of the Du Pont Equation by showing that it provides an overall financial view of the corporation under consideration. As a result of this interpretation, the order in which financial statements analysis is commonly performed should be changed. That is, in financial statements analysis, one should start with the analysis of the Du Pont Equation, to gain an overall understanding of the financial situation of the corporation, and then perform the ratio analysis, to gain a detailed understanding of the financial situation of the corporation.

Financial statement analysis involves the comparison of the company's performance with that of other firms in the same industry and the evaluation of trends in the company's financial position over time. Financial ratios are designed to evaluate financial statements. They are standardized numbers to facilitate comparisons in order to highlight weaknesses and strengths of the corporation under consideration. Financial statement analysis is used by manager, creditors, stockholders, stock analysts, suppliers, customers, employees, and regulators.

Commonly, the most important ratios are divided into five major categories: liquidity ratios, asset management ratios, debt management ratios, profitability ratios, and market value ratios. Commonly, the Du Pont Equation is analyzed after the analysis of the ratios.

In what follows, Section 2 discusses the methodology and shows a special interpretation of the Du Pont Equation, according to which the Du Pont Equation provides an overall understanding of the financial standing of the corporation under consideration. Section 3 discusses the results. Section 4 concludes the paper by

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<sup>1</sup> See, for example, the following textbooks: Berk and DeMarzo (2013), Brealey, Myers, and Marcus (2014), Brigham and Ehrhardt (2017), Brigham and Houston (2016), Keown, Martin, and Petty (2011), and Ross, Westerfield, and Jaffe (2010).

emphasizing that it would be more useful to interpret the Du Pont Equation first, in order to gain an overall understanding of the financial standing of the corporation under consideration; and then to perform ratio analysis, in order to gain a detailed understanding of the financial standing of the corporation under consideration.

### Methodology

The Du Pont Equation expresses the return on equity (ROE) as the product of three terms: profit margin ( $NI/Sales$ ), total assets turnover ( $Sales/Total Assets$ ), and the equity multiplier ( $Total Assets/Common Equity$ ), as shown in Equations (1) and (2). The equity multiplier is related to the debt ratio ( $Debt/Total Assets$ ) and reflects the debt ratio, as shown in Equation (3):

$$ROE = (Profit\ Margin) \times (Total\ Assets\ Turnover) \times (Equity\ Multiplier) \quad (1)$$

$$ROE = (NI / Sales) \times (Sales / Total\ Assets) \times (Total\ Assets / Common\ Equity) \quad (2)$$

$$Equity\ Multiplier = 1 / (1 - Debt\ Ratio) \quad (3)$$

There are two points about the Du Pont Equation which are important: (1) Why the ROE is chosen to be expressed in terms of the other ratios? and (2) What is the importance of the three ratios on the right-hand side of the equation? The answers are as follows. The ROE is chosen because it is the return to the common equity holders of the company. This ratio is important because the goal of the corporation is shareholders' wealth maximization. This ratio ties the ratio analysis to the goal of the corporation. Shareholders' wealth maximization is the goal of the corporation and sets the most fundamental criterion for the activities of the corporation. This means that one of the main purposes of financial statements analysis is to make sure that the managers are meeting the goal of the corporation, and if the goal is not met then the managers need to search for the source of problems and find ways to rectify them.

The second question raised above is related to the three ratios in terms of which the ROE is expressed. These three ratios play a major role in providing an overall view of the financial performance of the corporation. This is because the first term (i.e., the profit margin) summarizes the income statement of the corporation. It shows what percentage of the revenue of the company ends up in the profit and, by implication, what percentage of the revenue of the company is eaten up by the expenses which are incurred in running the corporation. That is, this ratio shows to what extent the corporation is managing its costs well compared to its revenue. The second term (i.e., the total assets turnover) summarizes the left-hand side of the balance sheet. It shows the extent to which the corporation has invested in assets in order to generate its level of sales. That is, this ratio shows whether the corporation has invested too much in assets in generating its level of sales. The third term (i.e., the equity multiplier) summarizes the right-hand side of the balance sheet. It shows what percentage of total assets of the corporation is financed with equity and, by implication, what percentage of total assets is financed with debt. That is, this ratio shows whether the company has borrowed a large amount compared to its equity.

These three terms respectively summarize the income statement, the left-hand side of the balance sheet, and the right-hand side of the balance sheet. Therefore, these three terms, in combination, summarize the two most important financial statements of the corporation: the income statement and the balance sheet. These two financial statements are very important because they reflect a great variety of the activities of the corporation.

Overall, therefore, the Du Pont Equation shows how the most important performance-related ratio (ROE) for the shareholders of the corporation is related to the two most important financial statements of the company. This means that, if the Du Pont Equation for the corporation is compared with that of any benchmark corporation, e.g., the average firm in the industry or industry average, then one would immediately be able to recognize what is the source of the difference between the ROE of the company and that of the industry average.

For instance, if the ROE for the company is below the industry average then the corporation's stakeholders would be concerned. If they compare the Du Pont Equation for the corporation, i.e., compare corresponding items on the Du Pont Equation, with that of the industry average then they would be able to recognize whether the problem lies in the income statement (i.e., expense control), the left-hand side of the balance sheet (i.e., asset management), the right-hand side of the balance sheet (i.e., debt management), or a permutation of the three.

At this time, a concrete example might be useful. Consider the financial statements and the other relevant data for Allied Corporation as provided in Table 1. Based on these data, the Du Pont Equations for the corporation ( $ROE_{corporation}$ ) and the industry average ( $ROE_{industry\ average}$ ) can be set up as in Equations (4) and (5):

$$ROE_{corporation} = (1.15\%) \times (2.33) \times (2.4) = 6.5\% \quad (4)$$

$$ROE_{industry\ average} = (3.5\%) \times (2.60) \times (2.0) = 18.2\% \quad (5)$$

These two equations are written side by side and the terms on these two equations can be correspondingly compared and interpreted. By comparing the ROEs, it can be noted that the corporation has performed relatively poorly with respect to meeting its goal of shareholders' wealth maximization. The immediate question, therefore, is what has caused this? By comparing the three terms on the Du Pont Equation, it can be seen that the main cause of the underperformance emanates from the left-hand side of the balance sheet, i.e., the asset management. In other words, the corporation has invested in too many assets in producing its level of sales. This raises a red flag regarding the asset management ratio of the company, and therefore, the next step is to analyze asset management ratios – such as days sales outstanding, inventory turnover, and fixed assets turnover – to see which asset or assets can be blamed for this underperformance:

$$\text{Days Sales Outstanding} = \text{Accounts Receivable} / \text{Average Daily Sales}$$

$$\text{Days Sales Outstanding} = 482,400 / (4,620,000 / 360)$$

$$\text{Days Sales Outstanding} = 37.59 \text{ days, versus 32 days for the Industry Average}$$

$$\text{Inventory Turnover} = \text{Sales} / \text{Inventories}$$

$$\text{Inventory Turnover} = 4,620,000 / 1,003,200$$

$$\text{Inventory Turnover} = 4.6x, \text{ versus } 7.0x \text{ for the Industry Average}$$

$$\text{Fixed Assets Turnover} = \text{Sales} / \text{Fixed Assets}$$

$$\text{Fixed Assets Turnover} = 4,620,000 / 432,960$$

$$\text{Fixed Assets Turnover} = 10.7x, \text{ versus } 10.7x \text{ for the Industry Average}$$

By comparing the asset management ratios for the corporation with the industry average, it is noted that the corporation has invested too much in accounts receivable and inventories.

## Results

This leads us to the conclusion that, as a general rule, it would be better to first construct and interpret the Du Pont Equation in order to obtain an overall view of the performance of the corporation; and then, perform a detailed ratio analysis, specially, in those areas that the firm is underperforming.

Table 1

### *Financial Statements and Relevant Data for Allied Corporation*

Balance sheet			
Cash	62,400	Accounts payable	210,240
Accounts receivable	482,400	Notes payable	270,000
Inventory	1,003,200	Accruals	168,000
Gross fixed assets	632,400	Long-term debt	509,534
Less: Accumulated depreciation	199,440	Common stocks	552,000
Net fixed assets	432,960	Retained earnings	271,186
Total assets	1,980,960	Total liabilities and equity	1,980,960
Income statement			
Sales		4,620,000	
Cost of goods sold		3,900,000	
Other expenses		516,360	
Depreciation		24,000	
EBIT		179,640	
Interest expense		91,200	
EBT		88,440	
Taxes@40%		35,376	
Net income		53,064	
Other data			
Share price		\$6.00	
Number of shares		120,000	
Dividends per share		\$0.22	
Lease payments		\$48,000	
Ratio	Industry average		
Current	2.7 x		
Quick	1.0 x		
Inventory turnover	7.0 x		
Days sales outstanding	32.0 days		
Fixed-assets turnover	10.7 x		
Total assets turnover	2.6 x		
Debt	50.0%		
TIE	2.5 x		
Profit margin	3.5%		
Basic earning power	19.1%		
ROA	9.1%		
ROE	18.2%		
P/E	19.2 x		
Market-to-book	1.4 x		

### Conclusion

This paper advanced an interpretation of the Du Pont Equation, according to which the Du Pont Equation provides an overall view of the financial position of the corporation under consideration. This leads to the conclusion that in financial statements analysis, one would better start with the analysis of the Du Pont Equation, to gain an overall understanding of the financial position of the corporation, and then perform the ratio analysis, to gain a detailed understanding of the financial position of the corporation. This order of analytical activities is the reverse of what is commonly done in financial statements analysis, in which, first, the analysis of ratios is done, and then, the analysis of the Du Pont Equation is done.

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