DU PONT ANALYSIS IN THE PRODUCTION AND PRESERVATION OF MEAT

ELEONORA IONELA FOCŞAN,
drd., Universitatea „1 Decembrie 1918" Alba Iulia, România,
e-mail: ionela.focsan@yahoo.ro
VASILE CRISTIAN IOACHIM MIRON,
drd., Universitatea „1 Decembrie 1918" Alba Iulia, România,
e-mail: cristi_mir89@yahoo.com
IOANA JELER (POPA),
drd., Universitatea „1 Decembrie 1918" Alba Iulia, România,
e-mail: ioanapopa2010@yahoo.com

Abstract

Du Pont analysis is a type of performance investigation of an entity, which identifies the strengths and weaknesses of performance and internal factors that influence its increase or decrease. In a Du Pont analysis the following rates are involved: economic rate of return, rate of return on equity and return on sales rate. This article attempts to correlate these rates with the profit, to identify risks that threaten the company. At the same time, it tries to develop a new method of correlation which involves all three rates. This method was applied to one of the largest companies in the meat industry in Romania, to see if this analysis is feasible. Analysis result does not fully meet expectations, leading to the proposal of another way to link all the variables. The proposal involves all three rates of the previous analysis, which were taken two by two. Another method of calculation is the determinant of the matrix which involves all the rates. In the end, the results of these new methods will be rigorously analyzed.

Key words: *Du Pont analysis, ROA, ROE, ROS*

JEL Clasification: *R13*

1. Introduction and context of the study

Nowadays, companies put more emphasis on financial performance. Thus, according to the author Arditti, as an investment to be profitable, the financial manager of the company should respond positive to the question: "Will the acquisition of this asset increase the value of the owner's equity?"[1]. For the manager to be able to answer this question, he must develop a complex financial analysis to identify strengths, weaknesses and potential risks that may threaten the company.

Du Pont analysis is a measurement of financial performance of companies on one hand, and on the other hand, it can be a model for guiding decisions to grow performance. Based on the results arising from the application of this model of analysis, managers can make better decisions about increasing the performance of the company they manage.

The pillar of the Du Pont analysis consists of the following variables: asset turnover, the rate of gross profit and equity coverage.

The research was guided by the literature in the field of scientific articles published in various journals, and databases to collect digital information .

The paper is structured in three parts. The first part of the research includes a literature review to identify the current state of research. The paper continues with the second part, in which it is presented the application of Du Pont analysis. The last part is a case study drawn from a company producing meat products, in which are indicated rates of return and the bond between them, for a period of 10 years.

2. Literature review

Du Pont analysis system was introduced in 1920 in the U.S. company DuPont chemicals. At that time, this system materialized in an intuitive and systematic representation of the profitability of the company.[2]

The subject is covered in 1989 by Selling and Stickney, who analyzed the Du Pont system by comparing various industrial sectors, but also within the same industry. They identified as influencing factors, the following elements: product life cycle, businesses, internal strategies of each company, but also the significant time differences

between industries and also within the same industry. Their analysis was focused on two very important indicators in a company, profit margin and asset turnover.[3] In 2004, the author Suliman is using the Du Pont analysis for each industry, in order to specify future profitability of operating assets, decomposing RNOA (Return on Net Operating Assets) into two components: profit margin and inventory turnover.[4] A little later, in 2008, the author investigates the components of Du Pont analysis and concludes that the information obtained from this analysis are favorable to estimate future income.[5] Thus, according to this establishment, the information gained from the application of this analysis are the operating characteristics of a company.

In 2010, Kevin Bernhardt takes over the study developed by professors from Texas Tech University from United States of America, by synthesizing the strengths of Du Pont stating that "Du Pont analysis system combines data from the income statement with the balance sheet in two summary measures of profitability: economic rate of return (Return on Assets - ROA) and the rate of return on equity (Return on equity - ROE)."[6]

A year later, researchers M. Herciug, C. and L. Belascu Ogrean, in the article "A Du Pont analysis of the 20 most profitable companies in the world" studied the components of the rate of return on equity (ROE) and the size of the profit for the first 20 companies considered the most profitable in the world. For this study, researchers concluded that profitable entities are not necessarily the most attractive to investors, so that the classification based on a size indicator should be combined with a number of financial indicators, expressing the ratio of the effects and the efforts of the companies. Also a scale indicator is the rate of return on sales (ROS), indicator that determines how profitable are the company's sales, after deducting all expenses, including taxes and interest.[7]

Du Pont analysis has experienced many transformations over time, each one contributing to the improvement of this method of analysis, becoming today a method often used in decision making by managers of companies.

3. Research methodology

Du Pont analysis is based on three measures of the company's performance:

- Return on Assets (ROA)
- Return on equity (ROE), also known as the financial return
- Return on sales (ROS)

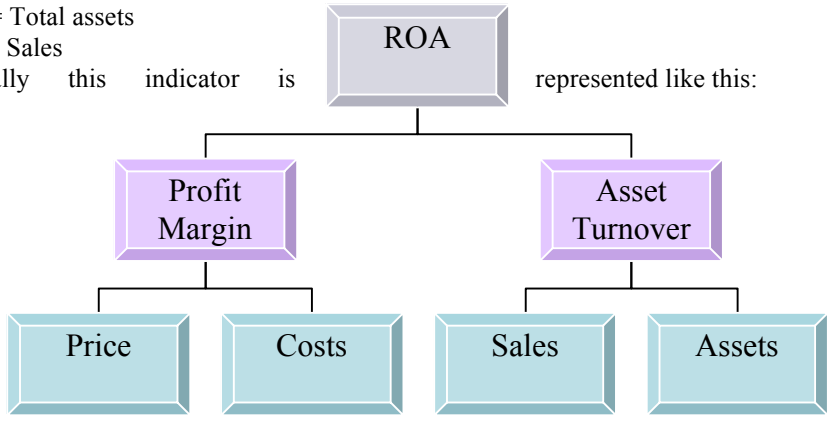
Analysing each measurement indicator from above we found out:

Return on assets (ROA) is influenced by net profit and total assets, thus the resulting relationship will be:

$$ROA = \frac{PN}{TA}, \quad ROA = \frac{PN}{V} \times \frac{V}{TA}, \qquad (1)$$

where: PN = Net profit
TA = Total assets
V = Sales

Schematically this indicator is represented like this:



Graphic no. 1: Graphical representation of return on assets, own source

Regarding the rate of return on equity, it is influenced by profit margin, inventory turnover and capital multipilication:

$$ROE = \frac{PN}{V} \times \frac{V}{TA} \times \frac{TA}{CT} \rightarrow ROE = \frac{PN}{CT} \qquad (2)$$

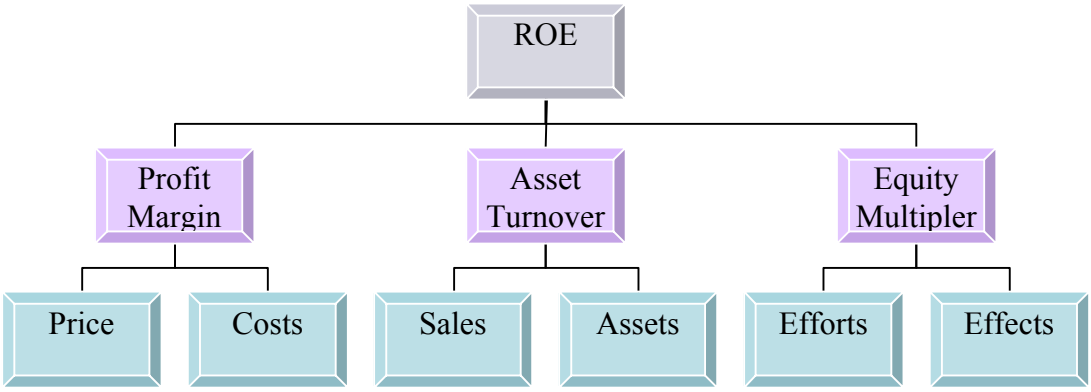
where: CT = Total capital

$\frac{PN}{V}$ = Profit margin

$\frac{V}{TA}$ = Asset Turnover

$\frac{TA}{CT}$ = Equity Multipler

Schematically this indicator is represented like this:

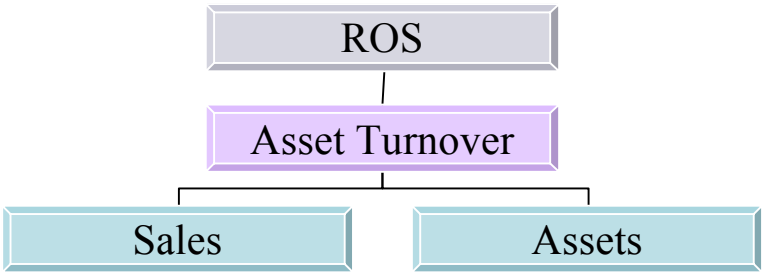


Graphic no. 2: Graphical representation of return on equity, own source

The third indicator, rate of return on sales is influenced by total assets and sales recorded by the company:

$$ROS = \frac{V}{TA}, \qquad (3)$$

Graphically, the sales rate of return is expressed as:



Graphic no. 3: Graphical representation of return on sales, own source

To identify the relationship between net income, ROA, ROE and ROS we'll determine the correlation coefficient Correl following the formula presented below:

$$C_{x,y} = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2] \times [n\sum y^2 - (\sum y)^2]}}, \qquad (4)$$

where: n = number of elements, variabiles

x, y = elements or variabiles (in this case the variabiles are: net income, ROA, ROE and ROS).

The closer to 1 is the resulting value of this correlation , the stronger is the link between the elements. The closer the value is 0 , the connection between variables becomes weaker. Correlation coefficients can be in the range [-

1, 1]. A correlation coefficient equal to 1 represents an increasing linear link, called direct-related variable between these two. A correlation coefficient equal to -1 represents a decreasing linear chain, called indirect. Measuring the intensity of the relationship between the two variables has the following interpretation intervals:

- [0 - 0,2] represents a very weak relationship, non-existent
- [0,2 - 0,5] represents a weak relationship
- [0,5 - 0,75] represents a medium intensity relationship
- [0,75 - 0,95] represents a strong relationship
- [0,95 - 1] represents a very strong relationship.

Starting from the 4-th formula the proposal is more complex correlation between the three rates of return.

$$C_{x,y,z} = \frac{n\sum xyz - (\sum x)(\sum y)(\sum z)}{\sqrt{[n\sum x^2 - (\sum x)^2]\times[n\sum y^2 - (\sum y)^2]\times[n\sum z^2 - (\sum z)^2]}} \qquad (5)$$

where: n = number of elements, variabiles

x, y, z = elements or variabiles (in this case the variabiles are: ROA, ROE and ROS).

Since there is a correlation between the three rates, we can get values in the range [-1, 1]. Just as in the case of the correlation of two variables, obtaining a value of -1 and 1, is a perfect correlation. Results similar to these values, the correlation is strong, and if it is closer to 0, the corelation is weaker. If the result is 0, these three rates are completely uncorrelated.

Another formula that links the three rates is the determinant of a matrix consisting of ROA, ROE, ROS in the last three years. Thus we obtain the following determinant:

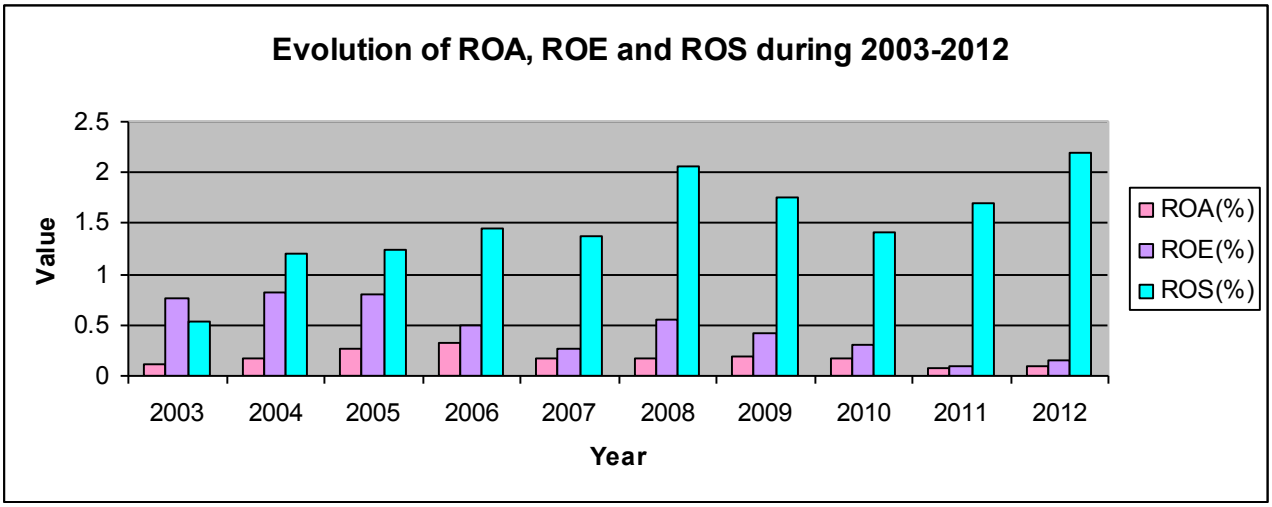
$$\begin{vmatrix} ROA_1 & ROE_1 & ROS_1 \\ ROA_2 & ROE_2 & ROS_2 \\ ROA_3 & ROE_3 & ROS_3 \end{vmatrix} = (ROA_1 * ROE_2 * ROS_3) + (ROA_2 * ROE_3 * ROS_1) + (ROE_1 * ROS_2 * ROA_3) - (ROA_3 * ROE_2 * ROS_1) - (ROE_1 * ROA_2 * ROS_3) - (ROS_2 * ROE_3 * ROA_1)$$

In the following chapter, all the existing and proposed formulas will be applied to a meat processing company.

4. Du Pont analysis model application in the production of meat

Considering the data of a company producing meat (data found in annex no. 1 related to this article), we applied the model analysis Du Pont for the last 10 years of the company activity, to determine profitability based on formulas (1), (2) and (3) above. The result would be:

Graphic no. 4: Evolution of ROA, ROE and ROS during 2003-2012



By analyzing the resulting data (found in annex no. 2), we observed that in terms of rate of return on assets (ROA), the highest profitability was recorded in 2006 (0.32%), the lowest was recorded in 2011, 0.07% . In terms of rate of return on equity, it recorded the highest profits in 2004 (0.83%) and lowest in 2011, to 0.10%.

Regarding the rate of return on sales, the highest percentage was 2.20%, recorded in 2012, and the lowest percentage was 0.54%, recorded in 2003.

As a result of calculation methodology of the appropriate correlation coefficient we obtained the following:

As for the correlations made between net income, ROA, ROE and ROS, they are quite weak, being more closer to 0 than to 1. The result obtained by correlating ROA and net income of +0.73, indicates a direct link having a medium intensity being situated in the range [0.5, 0.75]. Also a direct link, but this time very weak, given by the value of + 0.22 is established between the same income and ROS, this value is within the range [0.2, 0.5]. Only between ROE and net income is established an indirect very weak correlation, almost non-existent, with a result of -0.03.

Things are not better regarding the correlations between all the three rates. According to the result obtained from the variables ROA and ROE, here is established a weak direct correlation, the result (+0.45) is within the range [0.2, 0.5]. Among the variables ROA and ROS the correlation established is a very weak and indirect one, the result being -0.16. Also an indirect correlation is established between ROE and ROS, resulting -0.61, showing that the connection between these two values is one of medium intensity.

Below is applied the previously proposed formula, which concerns all three rates of return (formula no. 5). Applying this formula the entity concerned, we get:

$C_{ROA, ROE, ROS} = - 0,1391$

From the value obtained (- 0,1391) it is clear that between these three rates is a weak indirect correlation.

Further we calculate the previously proposed determinant for the three rates of return for the past 3 years.

$$\begin{vmatrix} .09 & .15 & .2 \\ .07 & .1 & .69 \\ .18 & .3 & .41 \end{vmatrix} = 0,004485$$

Taking into account the correlation between percentage rates, the value 0,004 means a linear correlation, representing the average of the last three years. As the result is closer to 0, we conclude that between these three elements is a very weak direct correlation, almost non-existent.

If the resulting value of this determinant is a value close to unity then this value can provide information about the company's evolution in the last three years and would help future decisions. A follow-up of the evolution of the result of this determinant could be more useful for the management of the entity by the fact that determining the results for consecutive years will reduce the calculation error as in the case of considering just three years.

5. Conclusions

The returns analyzed in this article do not guarantee the maximization of the entity's profit by directing capabilities into assets, capital and sales, but provides an overview of the company by linking them. Such a correlation method is analysis Du Pont, which will result in these three rates: ROA, ROE and ROS.

The dependence of these variables can be determined by their connection in the past years. In this research, the correlation has been established for the past 10 years. While the results of these correlations are often weak, this reveals that, for example, a high rate of return on assets does not imply a high rate of sales.

Our proposal in this research is to establish a correspondence between all analyzed elements. The result of this correlation shows that they are less correlated. Taking into account these three related rates of the last three years, the goal was to find the correspondence from the point of view of the evolution of the same rate from year to year, and the connection between each three rates of the same year.

Given the downward trend from 2010 to 2011 of the ROA, followed by an upward trend from 2011 to 2012 of the same rate, and the ROS had an upward trend from 2010 to 2012, we can easily see that in the first and in the last column of the determinant the values recorded are completely uncorrelated (some of them being decreasing, and the others growing).

The result of this determinant does not provide enough information for the manager of the meat producing company because the value obtained is not safe enough in making decisions about the assets growth or the capital growth by how they influenced the profit in the last three years. The assets and the capital of the company are internal factors that influence the increase or decrease of the profit, while sales volume depends in particular on market demand. In the next three years, a steady growth of capital and assets may not result in expected profit because in the same period sales could decrease, influenced by the market. Looking only at the first two columns of the determinant, we can conclude that ROA and ROE are strongly correlated, so the

influence of the third column leads to the weak correlation recorded.

This connection between ROA, ROE and ROS represents an average of the connections between each of these elements.

This analysis can be drawn up for any company, not only for companies that produce meat products and not only for those companies which record such turnover and profit.

Acknowledgement

„This paper has been financially supported within the project entitled „SOCERT. Knowledge society, dynamism through research", contract number POSDRU//159/1.5/S/132406. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. Investing in people!"

6. References

[1] **F. Arditti**, Risk and the required return on equity, The Journal of Finance, vol. 22, No. 1, 1967.
[2] Du Pont company: http://www.dupont.com/
[3] **T, I, Selling and C, P, Stickney**, The effects of business environments and strategy on a firm's rate of return on assets, Financial Analysts Journal, 1989
[4] **M, T, Soliman**, Using Industry – Adjusted Du Pont analysis to predict future profitability, articol disponibil pe site-ul: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=456700 – accesat la data 18.02.2014
[5] **M, T, Soliman**, The use of Du Pont analysis by market participants, The accounting review, vol. 32, 2008
[6] **Texas Tech University**: (accesat la 18.02.2014)
http://www.aaec.ttu.edu/faculty/phijohns/AAEC%204316/Lecture/notes/DUPONT.htm
[7] **M. Herciug, C. Ogrean și L. Belascu**, "A Du Pont analysis of the 20 most profitable companies in the world"(2011), International Conference on Business and Economics Research, vol.1 (2011) IACSIT Press, Kuala Lumpur, Malaysia
[8] ***www.totalfirme.com
[9] ***www.mfinante.ro

Annex no. 1

Reporting period / Indicator	Total assets	Total equity	Total sales	Net profit
2012	155715328	94791573	342968393	14219628
2011	209783665	137717663	355471527	13884870
2010	205098240	125023269	289421860	37508040
2009	173808144	84980801	304892075	35582812
2008	156817231	49588465	323402533	27593378
2007	126210655	86466372	174233748	23080438
2006	110271721	71376988	160418199	35299556
2005	111067601	36156004	137929836	29085778
2004	87318235	18598031	104352466	15368827
2003	82052147	12769464	44393172	9670275

Source: www.totalfirme.com [8], www.mfinante.ro [9]

Annex no. 2

Reporting period	ROA (%)	ROE (%)	ROS (%)
2012	0.09	0.15	2.20
2011	0.07	0.10	1.69
2010	0.18	0.30	1.41
2009	0.20	0.42	1.75
2008	0.18	0.56	2.06
2007	0.18	0.27	1.38
2006	0.32	0.49	1.45
2005	0.26	0.80	1.24
2004	0.18	0.83	1.20
2003	0.12	0.76	0.54

Source: own calculation