

THE DETERMINATION OF THE COEFFICIENT OF PROPORTIONALITY THROUGH THE FORECASTING METHODS

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Abstract

The financial forecast represents a wide open field to the researches from the economic field that comprise a series of techniques and methods which can be applied with success in a high performance management. The theme of the article is a part of the interest area of the research field “Innovation Management, Risk Management and Crisis Management”.

The research methodology is a fundamental one, but also an application one. It is a fundamental research because through the theme approached we have tried to ensure new approaches towards knowledge and offering new practical application in the future, and an application research because we shall use the results of other research categories, as well as empirical knowledge transforming them into forecast and measurement techniques for improving the management of a company.

The aim of the article is that of highlighting the way in which the proportionality coefficient is determined with the help of the forecast methods “percentage of turnover” or “speed of rotation”. Thus, it is forecasted the value of the proportionality coefficient for the year for which the forecast is desired, according to the evolution of this coefficient and eventually of the optimizations that the company has in consideration.

The objective of the article is represented by showing the possibility of applying a modern technique of financial forecast that can be used in the economic and financial activity of the company.

On the basis of those mentioned above it can be confirmed the relevance and the degree of excitement of the theme investigates in comparison with the existent research.

KEY WORDS: proportionality coefficient, inventory turnover, financial forecast.

JEL CLASSIFICATION: G3 - Corporate Finance and Governance

1.Introduction

In the context of forecast and financial analysis it is created the premise of the establishment of causal relationships between the economic phenomena, also of the factors which influence the phenomena, having as aim, finally, to establish the best

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strategies of management performance of a company. Taking into consideration the direct connection between turnover and stocks, the final strategy of increasing the turnover must highlight a real situation, having in view the evolution and management of stocks, as also the forecast methods of them.

By writing this article we have tried to bring an intake to the research area by emphasizing not only the theoretical part of the theme approached but also the application one, considering that these financial forecast methods can influence significantly the management of a company. Also, we have tried to realize an extension of the problem regarding the proportionality between two elements dependent one to the other. In our case, we have chosen the turnover and stocks, two important elements that put their fingerprint on the evolution of the economic activity of a company. Thus, for determining the proportionality coefficient we have chosen two forecasting methods respectively “percentage of sales” and “speed of rotation”.

In elaborating this article we have consulted the analysis and reference studies of some authors from the Romanian and foreign literature. By performing an arrangement of the approaches from the domain literature regarding this theme, we have tried to surprise the applicability and efficiency of the forecast methods with the help of the proportionality coefficient.

Concerning the application of the financial forecast methods, in the specialty literature we find a series of authors of some books or specialty studies related in a smaller or bigger measure to the subject. We shall mention some of these: Păvăloaia W., Coccoșilă M., Helfert E., Buglea A., Lezeu D., Stanci I., Popa L., Spătaru L., and the examples may continue.

2. Materials and methods

In establishing the theory for this article we have started by presenting the definitions of key elements of this research (proportionality coefficient, turnover, stocks, ‘percentage of turnover’ method and ‘speed of rotation’ method), definitions which have as role to indicate precisely the significance of the terms presented previously. After presenting these definitions we have described a series of aspects which offer information referring to the behavior of the key elements from the study. The next step in establishing the theory for this article has been the presentation of a set of predictions which are deducted from the hypothesis of the theory and the presentation of a work hypothesis with the view of confronting the theory with the economic theory. Also, in deepening this article we have used the following operations for studying the economic phenomenon: observation, the explanation and forecast.

In what regards the methods used, we have chosen the analysis and synthesis unit method, the historical method, the unit quantitative and qualitative analysis methods and also the economic- mathematical modeling. We shall describe briefly each method which has put its fingerprint more or less in realizing this article.

The analysis and synthesis unit method involves two actions is particularly important for the analysis of an economic phenomena. The analysis involves the dismemberment of

the phenomenon in its component parts, each being analyzed as complex, and the synthesis involves bringing together components of reconstituting the entire phenomenon, highlighting the key elements and the dominant trends in the evolution of the phenomenon under study.

The historical method is a method that starts from the historical evolution of the analyzed phenomenon that is considering the following moments: emergence, development, evolution, transformation and disappearance of the phenomenon, using in particular historical data.

The method of quantitative and qualitative analysis unit involves the evaluation of economic quantities in natural units and in money then searching arrangements for the transformation of quantity into quality, meaning shift to new ways of organizing the economic activity, to a new level of economic development.

The economic-mathematical modeling involves the schematic reproduction of a process or economic phenomenon in the form of a linear system, consisting of variable sizes, that allows the development of scenarios of the evolution and the choice of optimal variants. The economic-mathematical models are presented in the form of equations and mathematical formulas or in the form of graphs.

3.The methodological and theoretical approach

In the theoretical part of this article we are going to start with the presentation of the definitions of the key elements around which this study is coated. We remind that these concepts are: the coefficient of proportionality, inventory, turnover and the two methods of forecasting.

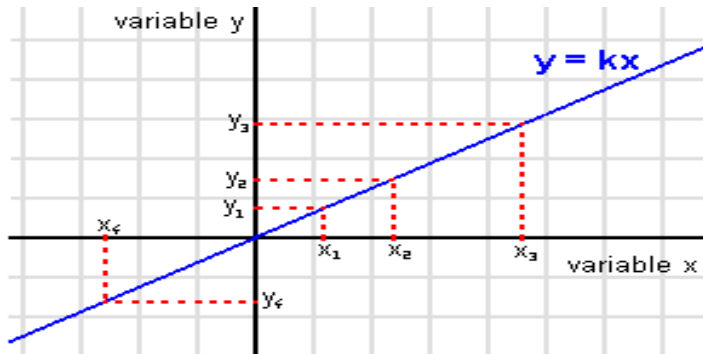
The coefficient or proportionality factor is a concept used in the mathematical realm, but it is used with much success in the economic field and represents the value of the ratio of two quantities directly proportional to x and y . In the literature and in the financial practice the coefficient of proportionality is used to highlight two elements of proportionality depend on one another.

A short definition of the proportionality factor we can find it on the site www.thefreedictionary.com which mentions that this represents „ the constant value of the ratio between two proportional measures x and y noted usually as $y = k \cdot x$ where k is the proportionality factor”.

In the mathematical domain it is said that two variables are proportional if a modification in one is accompanied by a modification in the other and if these changes are concerned by the use of a constant. This constant can be called proportionality coefficient.

If one variable is always the product of others and the constant, the two are said to be *directly proportional*; x and y are directly proportional if the ratio x/y is constant. If the product of the two variables is always equal to a constant, the two are said to be *inversely proportional*; x and y are inversely proportional if the product xy is constant. (<http://en.wikipedia.org>)

Graphically these aspects are presented as:



(y is directly proportional with x)

Graph no. 1

The graphical representation of the proportionality coefficient:

Source: http://en.wikipedia.org/wiki/File:Variables_proporcionales.png

An effective storage policy involves speeding up the rotation of stocks, thereby improving the performance of the activity of a company, respectively to reduce expenditure and increase revenues. One of the factors on which inventory are subject to significant influence is turnover.

Accelerating the rotation speed, thereby improving the performances of the company requires: thorough study of the demand, timely completion of contracts, increased requirements in relations with suppliers in order to ensure a regular insurance and a range of products which correspond to the quantitative, qualitative and structural market requirements, the optimization of safety inventory by synchronizing the incoming and outgoing flows, the optimization of supply terms in accordance with the specific conditions of each unit, the expansion of direct supply, the promotion of modern forms of production and sale, the effective use of human and material potential of the company (Niculescu M., 2003).

The inventories are fixed assets, which must be used rationally and dimensioned as judiciously, according to the nature and their destination: the current inventory, safety, seasonal, and so on (Petrescu S., 2004)

In a broad sense the turnover represents the totality of income from the sale of goods, provision of services and execution of works. It is the one of the most important indicators that reflect a company's performance and can take a number of forms including: net turnover, turnover margin, critical turnover, average turnover.

The proportionality between the necessary of financing the operational cycle and the turnover of the management period considered is an important problem that highlights the connection between turnover and inventory. The quarterly necessary is determined as:

$$Nec_{trim} = \frac{CA}{90} \cdot Rc$$

where:

Nec_{trim} - the necessary quarterly determined on each of the significant elements presented above;

CA –turnover quarterly forecasted;

Rc – the kinetic rate(days outstanding of the current assets in ratio with turnover).

The necessary of financing quarterly is established by each category of inventory, in accordance to the specific kinetic ratios and determined previously on the basis of the financial statement of the previous year.

As a particularly important problem for the optimal investing in stocks is the structure and quality of them, the possibility of selling and transforming them quickly in money, meaning the degree of liquidity of the merchandise stocks, packages and other assets.

As a significant part of the current assets is covered through short-term bank loans, the company is in a position to deal in any time with the commitments from banks; or it may be made only to the extent that can distribute operatively stocks purchased. In the event that the organization achieves turnover not provided and cannot honor obligations in time against third parties (banks, suppliers, other operators) it goes into default and can be placed in judicial liquidation even if, generally speaking, it works effective and it is solvent. (Sighiea N., Popescu L., 2003)

The method "percentage of sales" is based on two ideas: stocks vary with the turnover and the value of inventories is optimal or at least satisfactory in relation to turnover. In a market economy, turnover is the dominant indicator of the economic life of a company. Depending on sales, the production capacity, the supply, the number and structure of staff are adjusted.

Also, this method can use any of the elements of the financial statements that vary in proportion to sales. In applying this method we emphasize the following steps:

1.the computation of the percentage for „t” period:
$$p_t = \frac{\text{elementu "x}_t\text{"}}{CA_t} \cdot 100$$

where:

$t = 1, n$

x_t – the estimated value for „t” period of the element related to turnover;

CA_t – turnover of „t” period;

2.prediction for „t+1” moment: $x_{t+1} = p \cdot CA_{t+1}$

where:

p – the predicted percentage computed usually as an average of the percentages for the historical periods p_0 ;

x_{t+1} – the predicted item for „t+1” period;

CA_{t+1} – the estimated turnover for „t+1”;

The main advantage of using the "percentage of sales" method is the ease with which it can be applied. But there are also weaknesses of this method such as the planning realism. For example, the specific capitalization elements such as assets, the need for working capital and net cash are not proportionate in relation to turnover:

the assets will not rise in correlation with the sales until after the completion of the available production capacity, in jumps, and therefore, their planning is based on the rate of utilization of the production capacity;

the net current assets may be in a direct proportionality with the square root of turnover.

However, the 'percentage of sales' method is frequently used in the financial planning.

The method "rotation coefficient" is based on the use of a coefficient also called the number of rotations made by a volume of current assets and is determined as the ratio between the business volume achieved expressed through the turnover (CA) or the production budget (Qe) and the amount of current assets used for this purpose (Ac). (www.contabilizat.ro)

This indicator shows how many rotations the current assets make in a period (year, quarter etc.), but what is more important is the calculation of the number of rotations per categories of stocks, the rotation on their elements, as this aspect will provide more detailed information on the management of raw material, reflecting and locating positive and negative behaviors of various business activities.

Together with defining this indicator we also calculate and analyze the speed of inventory turnover, and a rotation corresponds to a certain time that the shorter the faster the company can recover the initial capital invested, and if the proceeds are greater than the payments this period a surplus of money is recorded (own funding source). This indicator shows in how many days the current assets make a fully rotation or over how long time one dollar invested in fixed assets will be recovered. The speed of rotation will be speeded up (current assets have a more efficient use) when the rate of rotation will be greater and the length of a circuit smaller.

4. Working hypothesis

Our work hypothesis corresponds to a guiding idea, a theme that will guide the research towards observation and anticipation of the existence of the proportionality between two or more phenomena or elements, connections to be validated by experimentation. Specifically in this article we highlight the proportionality between stocks and turnover, reflected at the end in an estimation of the optimal values of the stocks. Thus, we used two methods of prediction, namely the 'percentage of sales' and the 'rate of rotation. "

The reasons I chose this working hypothesis are mainly the following: the simple and effective approach to these methods, providing information to meet the needs of an enterprise, operational forecasting needs, providing a fairly detailed picture of short-term forecasting, determining proportionality between two parts dependent on each other. Data used in the development and deepening of the work hypotheses were taken from the site of Public Finances in SC OMV PETROM S.R.L.

4.1. Determination of the coefficient of proportionality through the 'percentage of sales' method

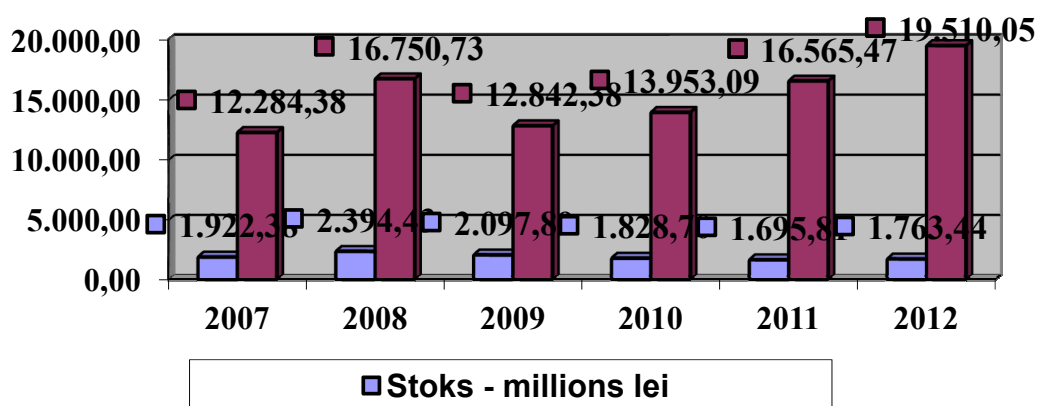
To highlight the role and importance of the proportionality coefficient we took into account two important indicators that will influence a company's business development, namely turnover and stocks. First we analyze the evolution of stocks and turnover of SC OMV PETROM S.R.L. for the past six years and it is as follows:

The stocks and turnover evolution of S.C. OMV PETROM S.R.L Table no. 1

NR. CRT.	Year	STOCKS - LEI	NET TURNOVER- LEI
1.	2012	1.763.435.040	19.510.054.765
2.	2011	1.695.805.503	16.565.465.973
3.	2010	1.828.696.965	13.953.092.655
4.	2009	2.097.889.862	12.842.384.017
5.	2008	2.394.434.361	16.750.726.457
6.	2007	1.922.375.343	12.284.378.408

Data source: www.mfinante.ro

Based on the above data, the stocks and turnover evolution is as follows:



Graph no.2

The stocks and turnover evolution of S.C. OMV PETROM S.R.L. during 2007-2012

Source: own processing of the data

From the data and the graph presented it can be seen that the turnover values were quite significant throughout the period considered, the highest values were recorded in 2008 and 2012. The evolution of stocks was a fairly constant, only the years 2008 and 2009 made a small exception, they recorded values over two billion. Regarding the share of stocks in turnover, this generally included low values up to 16% of turnover. This signifies a favorable situation for SC OMV PETROM S.R.L.

Starting from the idea that stocks are designed to synchronize processes with different rates (supply-production-distribution-sales), they must ensure the efficiency of operation, and finally to positively influence the financial results of the company. Based on

these considerations, we proceed to analyzing and determining the proportionality of the asset, inventory and sales. The first step in determining the coefficient of proportionality is to determine the percentage value of stocks in turnover as average, minimum and maximum value. For this we start from the next calculation relation:

$$G_{\text{stocuri}} = \frac{\text{Stocuri}}{\text{Cifra de afaceri}} \cdot 100 \cdot$$

The computation of the share of stocks in the turnover of S.C. OMV PETROM S.R.L Table no. 2

NR. CRT.	Year	STOCKS - LEI	NET TURNOVER - LEI	$G_{\text{stocuri}} = \frac{\text{Stocuri}}{\text{Cifra de afaceri}} \cdot 100$
1.	2012	1.763.435.040	19.510.054.765	9,04
2.	2011	1.695.805.503	16.565.465.973	10,24
3.	2010	1.828.696.965	13.953.092.655	13,10
4.	2009	2.097.889.862	12.842.384.017	16,34
5.	2008	2.394.434.361	16.750.726.457	14,29
6.	2007	1.922.375.343	12.284.378.408	15,65
7.	Average value	-	-	13,11
8.	Minimum value	-	-	9,04
9.	Maximum value	-	-	16,34

Knowing that the stock size is dependent on the turnover we determine the coefficient of proportionality recorded until the time of forecast. Thus, it will be necessary to predict how much turnover should increase in 2013 for the company's activity to be more profitable compared to previous years. Before setting the increase percentage in turnover for 2013, we first have to observe the growth trend of turnover recorded in previous years.

Determination of the growth trend of turnover of S.C. OMV PETROM S.R.L Table no. 3

NR. CRT.	Year	NET TURNOVER - LEI	$R_{\text{creștere CA}} = \frac{CA_1 - CA_0}{CA_1} \cdot 100$
1.	2012	19.510.054.765	17,78
2.	2011	16.565.465.973	18,72
3.	2010	13.953.092.655	8,65
4.	2009	12.842.384.017	-23,33
5.	2008	16.750.726.457	36,36
6.	2007	12.284.378.408	-
7.	The average increase in turnover	-	9,70

Given that turnover registered an average growth rate of 9.70%, for 2013 we forecast an increase in turnover of 15%. Thus if we consider the prediction, based on the proposed scenario regarding the stocks percentage in turnover rate as an average, minimum or maximum value, we estimate an expected size of stocks according to the relations below:

1. Procentul mediu · cifra de afaceri previzionată pentru anul 2013
2. Procentul minim · cifra de afaceri previzionată pentru anul 2013
3. Procentul maxim · cifra de afaceri previzionată pentru anul 2013

Thus, we obtain the following values:

Determining the optimal values of stocks by the ‘percentage of sales’ method Table no. 4

NR. CRT.	PERCENTAGE VALUES FOR HISTORICAL TIME PERIODS	$K = \text{procent} \cdot CA_{\text{previzionat}}$	OPTIMAL VALUES -LEI-
1.	Average value - 13,11%	$13,11 \% \times 19.510.054.765 \times 115\%$ or $13,11 \% \times 19.510.054.765 \times (1+15\%)$ or $13,11 \% \times 22.436.562.979,7$	2.941.433.406,63
2.	Minimum value - 9,04%	$9,04 \% \times 19.510.054.765 \times 115\%$ or $9,04 \% \times 19.510.054.765 \times (1+15\%)$ or $9,04 \% \times 22.436.562.979,7$	2.028.265.293,36
3.	Maximum value - 16,34%	$16,34\% \times 19.510.054.765 \times 115\%$ or $16,34\% \times 19.510.054.765 \times (1+15\%)$ or $16,34 \% \times 22.436.562.979,7$	3.666.134.390,88

From the calculations we observe that the maximum value of the stocks is of 3.666.134.390,88 lei. It should be noted that the main factors that determine the size of stocks are the projected level of sales, the manufacturing process time, the perishable finished products, the ease of supply and the ease of replacement of the stock, the consequences of failure to achieve a certain type of material. (Buglea A., 2008) These factors vary greatly from one economic sector to another, for example in tobacco stocks

have a high value due to a long production process while in the oil the stocks have lower value as raw material is not used.

4.2.Determination of the coefficient of proportionality through the „rotation time” or the „speed of rotation” method

This method also is related to the proportionality between the element dependent on the turnover, namely the stocks and the turnover and primarily involves determination of the rotation coefficient and the inventory turnover from the previous time of the forecast moment and secondly the determination of the inventory forecasting. The inventory turnover period is a financial indicator of operational efficiency, which evaluates the average period when the stocks of companies are transformed into finished products and sold to customers. Reducing the level of this indicator means accelerating the rotation.

The inventory turnover period is expressed in days and it is obtained by dividing the total inventories multiplied by calendar time to turnover. The indicator represents a measure of the efficiency of the production of the company and can provide information about the difficulties that appear in selling the existing stocks.

For S.C. OMV PETROM S.R.L the rate of rotation and the inventory turnover recorded the following values:

Calculation of the rate of rotation and the inventory turnover at S.C. OMV PETROM S.R.L. Table no. 5

NR. CRT.	YEAR	STOCKS - LEI	NET TURNOVER - LEI	RATE OF ROTATION or DURATION IN DAYS OF A ROTATION $Dz = \frac{St \cdot 360}{CA}$	NUMBER OF ROTATIONS PER YEAR or THE SOEED OF ROTATION $Nr = \frac{CA}{St}$ sau $Nr = \frac{360}{Dz}$
1.	2012	1.763.435.040	19.510.054.765	32,54 days	11,06
2.	2011	1.695.805.503	16.565.465.973	36,85 days	9,77
3.	2010	1.828.696.965	13.953.092.655	47,18 days	7,63
4.	2009	2.097.889.862	12.842.384.017	58,81 days	6,12
5.	2008	2.394.434.361	16.750.726.457	51,46 days	6,99
6.	2007	1.922.375.343	12.284.378.408	56,34 days	6,39
7.	Average value	-	-	47,20 days	7,99
8.	Minimum value	-	-	32,54 days	6,12
9.	Maximum value	-	-	58,81 days	11,06

Starting from the previous prediction regarding the increase in turnover of 15% for 2013, according to the proposed scenario regarding the rate of rotation and the inventory turnover through the turnover as an average, minimum and maximum value, we estimate the expected size of stocks as follows:

Determining the optimal inventory values through the "rate of rotation" method
Table no. 6

NR. CRT.	NUMBER OF DAYS OF AN INVENTORY TURNOVER	$K = \frac{CA_{\text{previzionat}} \cdot Dz}{360}$	OPTIMAL VALUES -LEI-
1.	Average value - 47,20 days	$K_{\text{mediu}} = \frac{22.436.562.979,7 \cdot 47,20}{360}$	2.941.682.701,77
2.	Minimum value - 32,54 days	$K_{\text{minim}} = \frac{22.436.562.979,7 \cdot 32,54}{360}$	2.028.015.998,21
3.	Maximum value - 58,81 days	$K_{\text{maxim}} = \frac{22.436.562.979,7 \cdot 58,81}{360}$	3.665.261.857,86

By applying the 'rate of rotation' on the projected turnover we obtained the same values for estimating the forecasted size of stocks. The management of these stocks is performed using the management rate expressed through the rate of rotation and the inventory turnover as stated in the table 5.

The duration in days of a rotation is that indicator which measures the time interval between the moment of investing a sum of money in current assets and the moment of their recovery by selling the finished products. The smaller the duration the more effective is the company's activity. This duration is influenced by multitude of factors that can be grouped into internal and external factors.

The internal factors are related to the economic activity of the company and are found in the cycle of production, the technological process complexity, the features of the stored products, the seasonality of production. The external factors are related to the environment in which the entity operates, being found in the economic situation, the connections between the company and its business partners (suppliers, clients). (Buglea A., 2008)

5. Results and conclusions

From the beginning we wanted that the results of this study would be a contribution to existing approaches in the literature in the field and also tried to analyze in detail the applicability and efficiency with which it can be analyzed and determined the coefficient of proportionality by using methods of forecasting. They have always been a key tool in developing future strategies for an effective economic and financial activity of a company.

The inventory management efficiency translates into profits generated mainly by: gains from additional sales due to providing the quality requirements and the deadlines of the customers, cost savings due to avoiding the problems of stocks, cost savings as a result of an optimal sizing of the inventory and of the size of orders. The main indicator of the

use of inventories is the inventory turnover. This indicator can be expressed as the number of turns and the duration in days of a rotation.

In conclusion, the time variation of the inventory turnover (accelerating or slowing it) has an effect on the financial position and the profitability of the entity. The financial consequences of the acceleration (deceleration) of the speed of rotation translate into mass releases of (immobilization) stocks. This is determined by the relationship:

$$E(I) = (Dr_1 - Dr_0) \cdot \frac{CA_1}{360} = \pm \text{lei}$$

Starting from the data from table no. 5 we establish if the inventory turnover of S.C. OMV PETROM S.R.L registered a slowdown or acceleration during the period under review.

$$E(I)_{2008/2007} = (Dr_{2008} - Dr_{2007}) \cdot \frac{CA_{2008}}{360} = (51,46 - 56,34) \cdot \frac{16.750.726.457}{360} = -227.065.403 \text{ lei}$$

$$E(I)_{2009/2008} = (Dr_{2009} - Dr_{2008}) \cdot \frac{CA_{2009}}{360} = (58,81 - 51,46) \cdot \frac{12.842.384.017}{360} = +262.198.673 \text{ lei}$$

$$E(I)_{2010/2009} = (Dr_{2010} - Dr_{2009}) \cdot \frac{CA_{2010}}{360} = (47,18 - 58,81) \cdot \frac{13.953.092.655}{360} = +1.199.750.013 \text{ lei}$$

$$E(I)_{2011/2010} = (Dr_{2011} - Dr_{2010}) \cdot \frac{CA_{2011}}{360} = (36,85 - 47,18) \cdot \frac{16.565.465.973}{360} = -475.336.843 \text{ lei}$$

$$E(I)_{2012/2011} = (Dr_{2012} - Dr_{2011}) \cdot \frac{CA_{2012}}{360} = (32,54 - 36,85) \cdot \frac{19.510.054.765}{360} = -233.578.711 \text{ lei}$$

From these calculations it follows that the inventory turnover decreased in 2008/2007, 2011/2010 and 2012/2011 and in the years 2009/2008 and 2010/2009 the inventory turnover increased. In the case of the reduction of inventory turnover, its consequence was the release of stocks, and in the case of the increase in the inventory turnover, its effect was the property of the stocks.

The results from the realization of this article allowed us to accept that the coefficient of proportionality can be used successfully in financial forecasting methods applicability. From the calculations we have seen that an effective stock management has a positive influence on one of the main economic and financial indicators of the company, the turnover. This hypothesis is also strengthened by the complex approach of the two forecasting methods in determining the optimal value of the inventory with which I also highlighted the two indicators reflecting the judicious management of stocks namely the speed of rotation and rate of rotation or the number of turns in days.

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