ANALYSIS MODEL FOR INVENTORY MANAGEMENT

CAMELIA BURJA, VASILE BURJA [*]

ABSTRACT: *The inventory represents an essential component for the assets of the enterprise and the economic analysis gives them special importance because their accurate management determines the achievement of the activity object and the financial results. The efficient management of inventory requires ensuring an optimum level for them, which will guarantee the normal functioning of the activity with minimum inventory expenses and funds which are immobilised. The paper presents an analysis model for inventory management based on their rotation speed and the correlation with the sales volume illustrated in an adequate study. The highlighting of the influence factors on the efficient inventory management ensures the useful information needed to justify managerial decisions, which will lead to a balanced financial position and to increased company performance.*

1. INTRODUCTION

Taking the form of tangible current assets, the inventory is found in all the production stages and is successively transformed from raw materials in elements of unfinished production (work-in-process), then in finished goods destined for sale. Inventory represents money expenditure until the moment when it leaves the enterprise as sold products, at which time their value is recuperated and it generates profit (Stancu, 2002).

The normal development of the manufacturing processes requires in an objective manner the building of inventory of raw materials. They must cover the production needs during the period between two supplies (cycle inventory) or can be constituted to prevent unexpected incidents (safety inventory) and to allow the running of conditioning operations for materials before they entry the actual production. For an

[*] *Assoc.Prof., Ph.D., "1 Decembrie 1918" University of Alba Iulia, Romania*
Prof., Ph.D., "1 Decembrie 1918" University of Alba Iulia, Romania, vasileburja@yahoo.com

accurate dimensioning of inventory it is necessary to have an adequate inventory policy, based on the particularities of the technological process and the achieved turnover (Yugang, 2009; Ballou, 2005).

Regardless of the destination of the inventory of the raw materials, they require a capital expenditure that increases the financing-need of the current activity. Inventory expenses include not only the necessary amounts to procure it, but also the amounts related to quality check depositing, selection, deterioration, damage and obsolescence (Müller, 2003). Their management on principles of rationality requires a continuous analysis process of their dimension and of the development of an optimum inventory. Moreover, the existence of work-in-process and of finished goods leads to additional expenditure of financial resources.

If inventory management is inaccurate then negative effects occur in the activity of companies because the existence of too large inventory leads to increased costs and reduced cash flow, and their sub dimensioning contributes to reduced sales. The mentioned aspects show the importance of accurate inventory management in ensuring the company's competitiveness (Felea, 2008).

In general, a good inventory management implies their formation at a level that will ensure both the requirements of the production process and the demand on the market, but will also allow the achievement of the company's performance indicators. The optic of a rational inventory management believes that its size is motivated by social need, and the decision to invest in these elements must be an option justified by the result of the analysis of other investment options of the companies' capital (Petcu, 2003).

2. THE ANALYSIS OF INVENTORY MANAGEMENT

The financial management of firms pursues broad coverage regarding inventory, but in terms of financial analysis, we consider relevant the inventory structure and its rotation.

The inventory structure allows the financial analyst to highlight the following aspects:
- the oversize or sub dimensioning of inventory elements;
- highlighting inactive inventory or slow-moving inventory, which generates expenditures;
- the evolution over time of inventory structure.

The relevant inventory for an enterprise is: raw materials, work-in-process and finished goods.

The increase of the share of raw materials within total inventory reflects the following aspects:
- the oversize of stock supply;
- the existence of inactive or slowly moving raw materials;
- reducing other categories of inventory due to the shortening of the production cycle and the speeding of distribution.

A significant deviation from the planned inventory of raw materials or from their share in enterprises with similar activity indicates deficiencies on the line of management for these inventory categories.

The increase of the share of the work-in-process takes place when the production cycle increases, which can have objective causes if the assortment structure of the production has changed, or subjective causes if there are difficulties in supplying, accidental interruptions or other causes.

Increasing the share of stocks of finished goods is recorded when the enterprise faces difficulties with the distribution of the production. In this case, the production on stock causes a financial blockage, the enterprise turns to additional credits and faces financial difficulties.

Conducting an analysis of inventory rotation provides information about the duration during which inventory moves successively through the economic cycle of supplying, production and distribution. Increasing the rotation speed of inventory means increasing the efficiency of its use and, implicitly, additional profit simultaneously with the release of financial resources. The specific analysis indicator is Inventory Turnover Ratio expressed by a Number of rotations (*NoAI*) or the Days' sales in inventory (*DdAI*) (Hada, 2009):

$$NoAI = \frac{TO}{AI} \qquad\qquad DdAI = \frac{AI}{TO} \cdot T$$

where:
TO is the turnover;
AI - average inventory, calculated as arithmetic mean between the value at the beginning and the value at the end of the management period;
T - analyzed period in days.

The number of rotation for inventory shows how many times the inventory of a company goes successively through the stages of supply, production and distribution during a management period and is recovered through sales. Another signification of this indicator suggests the ability of the company to transform current assets in money or trade receivables. A slow rotation speed may be a negative signal for managers, as well as for investors and shareholders regarding the real capacity of the company to sell its production.

The particularities of the production are an important factor is assessing the inventory size (Boute, et al., 2007). In the production stage, the inventory level must be adapted to the variations of quantity, quality, price and time so that it's necessary to have a control and adjusting system for inventory according to mathematic patterns in order to reduce as much as possible the risks induced by the unexpected changes of the market factors (Tomofumi, 2009). Companies coordinate the requirements of the processing, distribution, financing and management functions with the exigencies of the demand with the help of inventory management and control. Sale success depends on the ability to provide the products and services requested by the consumers in conditions of profitability. In the activity of organizations, the development of control practices for inventory is largely due to the direction of management systems towards implementing the concept of Total Quality Management (TQM) (Wild, 2002).

Conducting in dynamic an analysis of the inventory rotation highlights the influences of the determining elements that impact the change in the efficiency of inventory management according to the following relations:

- The influence exercised by the change of the turnover:

$$\Delta NoAI(TO) = \frac{TO_1}{AI_0} - NoAI_0$$

$$\Delta DdAI(TO) = \frac{AI_0}{TO_1} \cdot T - DdAI_0$$

- The influence of the inventory size:

$$\Delta NoAI(AI) = NoAI_1 - \frac{TO_1}{AI_0}$$

$$\Delta DdAI(AI) = DdAI_1 - \frac{AI_0}{TO_1} \cdot T$$

The increase of the number of rotations during a time period is equivalent with their participation on several times to creating the turnover, which is the main source of recovery of the costs and for obtaining a profit. At the same time, by reducing the period when the inventory is stationed in the economic cycle, the expenses with depositing the raw materials, work-in-process and finished goods are reduced so that the costs are lower, another favourable effect being the shortening of the capital expenditure period for inventory.

The evolution of sales clearly influences the inventory size and efficiency.

To study the correlation between inventory size and sales as expression of the demand on the market we can use an analysis model in which inventory is expressed depending on two influence factors, namely average daily sales (*Ds*) and rotation speed, expressed as stationing period in the economic cycle, according to the next relation:

$$AI = \frac{TO}{T} \cdot \frac{AI}{TO} \cdot T = Ds \cdot DdAI$$

The action of the influence factors on the change of inventory size is determined as follows:

- The influence of the inventory's stationing period within the economic cycle:

$$\Delta AI(DdAI) = Ds_0 \cdot DdAI_1 - Ds_0 \cdot DdAI_0 = Ds_0 \cdot DdAI_1 - AI_0$$

- The influence of the average daily sales (*Ds*):

$$\Delta AI(Ds) = Ds_1 \cdot DdAI_1 - Ds_0 \cdot DdAI_1 = AI_1 - Ds_0 DdAI_1$$

Material resources are immobilized or released by changing the inventory rotation speed. The relation that expresses the size of the released or immobilized inventory, needed to achieve daily sales in the current period, is the following:

$$AIreleased = (DdAI_1 - DdAI_0) \cdot \frac{TO_1}{T}$$

The expression actually signifies additional or less number of days for which the inventory size is changed depending on the average daily sales. If the calculated value of the expression is negative, the situation must be interpreted as being favourable to the company because material resources are released and the financing-need of the current activity is smaller. In case of a positive result, an increase of the expenditure capital for inventory is recorded and the increase of the financing-need requires finding additional financing resources for the activity. The situation must be analyzed in correlation with the changes of the production and of the sales, which, if exceed the inventory dynamic, justify their increasing and the increase of the necessary financial resources.

3. CASE STUDY

To operate the presented analysis model we extracted from the financial statements of one enterprise information regarding the evolution of the main inventory categories, which are presented in table 1.

Table 1. Inventory level and structure lei

Inventory elements	Year 2008		Year 2009		Deviations	
	Level	%	Level	%	+, -	%
Raw materials	4070	65,3	4333	75,6	263	6,5
Work-in-process	356	5,7	109	1,9	-247	-69,4
Finished goods	1809	29,0	1291	22,5	-518	-28,6
Total	6235	100,0	5733	100,0	-502	-8,0

Source: Financial statements

For the analyzed enterprise, the level and the structure of the inventory categories is presented in table 1. We can see from the data in the table that the share of raw materials increased in 2009 compared to 2008, simultaneously with the reduction of the share of finished goods and of work-in-process, the decrease being due to the change of the production structure in favour of a short production cycle and distribution improvement. The increase of the share of the raw materials inventory is justified by the increase of the physical production of the company.

The analysis of the inventory structure shows that the company will have to keep focusing its attention on reducing the stocks of finished products, by finding new distribution markets, but also by improving the supply, which will lead to reduced inventory of raw materials that block a significant part of the financial resources of the enterprise.

The inventory rotation speed is analyzed by starting from the data collected from the financial statements on which the efficiency indicators of the inventory management were calculated, according to table 2.

Table 2. Inventory management indicators, thousand lei

Indicators	Symbol	Period		Deviations	
		2008	2009	Absolute +, -	Relative %
Turnover	TO	27461	31198	3737	13,6
Average Inventory for the Period	AI	6235	5733	-502	8,0
Number of rotations for inventory, no.	NoAI	4,4	5,4	1,0	22,7
Days' sales in inventory, days	DdAI	83	67	-16	19,3
Average daily sales	Ds	75,2	85,5	10,3	13,7
Released/inactive inventory	AIr/i	-	-1367,6	-	-

Source: Financial statements of Company and calculated data

If we take into account that the minimum value that ensures acceptable efficiency of inventory management for a company with industrial profile is 8 rotations, which corresponds to 45 days for one rotation, we can notice from table 2 that the analyzed company has a relatively slow inventory rotation speed. In 2009, the rotation speed grew to 5.4 rotations and the Days' sales in inventory was reduced to 67 days, which shows a significant improvement of the inventory rotation and, implicitly, of their efficiency in use, approaching the normal value.

The effects of the main factors' influence on changing inventory rotation and speed are presented in table 3.

Table 3. The factors' influence on inventory rotation and size

Indicators	Symbol	Value
The turnover influence on the number of rotations, no.	$\Delta NoAI(TO)$	0,6
The turnover influence on the duration of a rotation, days	$\Delta DdAI(TO)$	-10
The influence of the average inventory on the number of rotations, no.	$\Delta NoAI(AI)$	0,4
The influence of the average inventory on the rotation duration, days	$\Delta DdAI(AI)$	-6
The influence of the rotation duration on inventory, thousand lei	$\Delta AI(DdAI)$	-1187
The influence of average daily sales on inventory, thousand lei	$\Delta AI(Ds)$	685

Source: Calculated data

For the studied company, the obtained results highlight an acceleration of the inventory rotation speed in 2009 compared to 2008 as a result of the influence of the two factors: turnover and average inventory. The increase of the rotation number from 4.4 to 5.4 meant a shortening of the stationing period of inventory in various stages of the manufacturing process by approximately 16 days. This acceleration was due to the favourable effect of increasing the turnover (the rotation number grew by 0.6 and the

duration of a rotation was reduced by 10 days) and reducing the inventory (the rotation number increased by 0.4 and the duration of a rotation was reduced by 6 day).

Reducing the stationing period of inventory within the economic cycle has lead to reduced inventory by 1187 thousand lei, while the rise of average daily sales needed additional inventory in amount of 685 thousand lei. The size of released or immobilised inventory needed to achieve daily sales in the current period, as a result of speeding their rotation speed, is 1367.6 thousand lei.

4. CONCLUSIONS

The presented analysis model for inventory management provides a basis for decisions regarding the supply, production and distributions activities of companies with respect to the situation and dynamic of inventory. Its existence conditions the running of the production program and, implicitly, the compliance with the contracts signed with beneficiaries, but, at the same time, it constitutes capital expenditure, regardless of the stage at which the economic cycle is. The model provides information about the factors that influence the efficient inventory management, offering managers the possibility to make realistic decisions concerning the mobilization of internal funds and the exploitation of the opportunities to reduce inventory, with favourable consequences on improving financial stability and on increasing economic performance. The results of the analysis show that the efforts to increase efficiency of inventory used must be directed towards several directions: speeding inventory rotation because by shortening its stationing period within the economic cycle it transforms rapidly into money; increasing turnover to the level demanded by the market; improving the whole trading system for products; reducing specific consumptions, etc.

Using analysis equations for the correlation inventory–sales, we can assess the speed with which the companies capitalize on their production, thus achieving the closing of the economic cycle and the satisfaction of the interests of the participants to the economic activity. At the same time, investors may have more information about the risk level of the companies where they want to make investments to exploit the available capital. A drop over time in the sales rate in comparison to inventory means a weaker capacity of the company to run its activity efficiently, in conditions of financial stability, meaning to transform assets into money, which make it less attractive.

To emphasize the impact over the financial situation, the analysis must be developed on the direction of the specific profitability indicators. At the same time, for an accurate assessment of the efficiency of inventory management and of the fairness of allotted funds for production, it's necessary to compare the financial situation with the main competitors.

In this context, it may be that the analysis of inventory management is a way to get to know the behaviour of organizations, facilitating the better functioning of the "interpretation-thinking-transmission" cycle [Tomofumi, 2009], which means the information obtained from inventory analysis and from other sources are subjected to an interpretation process and become the basis for making decisions whose final purpose is to increase the economic performance of companies.

REFERENCES:

[1]. Ballou, R.H. (2005) *Expressing Inventory Control Policy in the Turnover Curve*, Journal of Business Logistics, 26(2), pp.143-164

[2]. Boute, R.; Lambrecht, M.; Lambrechts, O.; Sterckx, P. (2007) *An analysis of inventory turnover in the Belgian manufacturing industry, wholesale and retail and the financial impact on inventory reduction,* [Online], Available at: https://lirias.kuleuven.be/bitstream/123456789/175504/1/KBI_0725.pdf, [Accessed 14 April 2010]

[3]. Felea, M. (2008) *The role of inventory in the supply chain*, Amfiteatru Economic, 24, p.113

[4]. Hada, T. (2009) *The Financial Management of the Enterprise*, Aeternitas Publishing, Alba Iulia, pp.132-134

[5]. Müller, M. (2003) *Essentials of inventory management*, AMACOM American Management, pp. 2-4

[6]. Petcu, M. (2003) *Financial Analysis*, Economic Publishing House, Bucharest, p.159

[7]. Stancu, I. (2002) *Finance,* Economic Publishing House, Bucharest, p.471

[8]. Tomofumi, S.; Masahito, S.; Matsuyama, K. (2009) *A proposal for inventory adjustment using "multiple-layers SEC-CIS model"*, International Journal of Production Economics, 118(1), pp. 208-216

[9]. Yugang, Y.; De Koster, M.B.M. (2009) *On the Suboptimality of Full Turnover-Based Storage,* ERIM Report Series Reference No. ERS-2009-051-LIS, [Online], Available at: http://ssrn.com/abstract=1485947, [Accessed 14 April 2010]

[10]. Wild, T. (2002) *Best practice in Inventory Management*, Publisher Elsevier Science Ltd., pp.4-11