



COMPUTER AIDED MONITORING OF INDICES FOR ECONOMIC EFFICIENCY IN WOODWORKING ENTERPRISES

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Abstract

Micro, small and middle enterprises in woodworking in Bulgaria have always needed of easy and usefull methodology for fast reliable economic analysis. Sophisticated methodology for traditional analysis is difficult to be understand from selfemployed manufacturers and employees in small companies. In the same time that methodology does not provide agregate and understandable distinguished information for external and internal environment. Presented here method is useful for all these small companies and software, used in their administrations.

Key words: *financial indices, possibility, crisis, queuing systems*

INTRODUCTION

Over the last few years many enterprises all over the world became spoiled due to the better economic conditions in their countries. Appearance of the world financial and consequently economic crisis revealed the imperfections of the management within the enterprises. Many of them had increased their loans to dangerous levels. In the same time senior managers had afford themselves the luxury to deliver assets with indirect and unclear effect to the production and especially to productiveness. Easy way for fast economic analysis with appropriate visualization of the results would provide to micro and small enterprises an approach for internal crisis revealing.

The main purpose of this article is to suggest model for easy monitoring of economic efficiency and crisis appearance wide useful for micro, small and middle enterpises and discuss ist implementing into MS Access.

MATERIAL AND METHODS

There is a great deal of methods for economic analysis of the enterprise's activities. The classic ones use many indices for turnover, profitability, liquidity etc. [1,2]. They decompiles these indices to smaller and reveal the reason for any condition. In fact it is not so easy for the managers in self-employed and small enterprises to understand the result and to indentify the reasons for problems. Some authors [5,6] integrate indicators in to substantial and unimportant ones. It is a way to give a hand to the small firms but there

appear the main questions: What is the connection between the indices?; Which of them present the influence of external and which internal factors?

Nowadays the market of software decisions for computer aided management is highly improved. There are many programs for Supply Chain Management, Total costs management etc. like SAP; R-1 and many others. Using the capabilities of Microsoft Office applications it is possible to give the managers easy tool for analysis and crisis revealing. Almost every micro and small enterprise has Microsoft Access as asset. The main task here is to induce the methodology for convenient calculus and interpretation.

Many definitions for crisis within the enterprise exist. The most common characteristics of it are: fluid state condition; possibilities for achieving steady state is getting worse. In this research the main feature of crisis is risk. This is the probability for appearance of bad circumstances in internal and external environment.

There are four main stages of crisis into enterprise [3]:

- Latent period- the possibilities of appearance have already been established but there are no symptoms, obvious for the managers.
- Collapse- in all business activities into enterprise become instable. Indices for profitability, liquidity etc. decrease. Inventories levels increase. Market share stints and contractors debts increase.
- Depression- this is the beginning of the end. All indicators get stable but low.
- End of the crisis- all indices are in the bottom but become unstable again. Some of them rarely increase. All preconditions for improvement and recover the production are available.

Crisis more often appear in the phase of drop, in the firm's development. But it is very possible to rise in each other phase.

Crisis may be classified in the next categories:

- Externally; internally or both induced.
- Crisis provoked by the management mistakes or actual independent circumstances.
- Crisis in the supply, in the production (theory of the costs are part of the theory of production [6]), distribution, personnel (personnel exists in all shown economic functions, so it has toe distinguished).
- Heavy or light crisis.
- Usual or casual.

To introduce any enterprise like a Queueing system at first it is necessary to determine the type of system and the type of relation between it and the main fields for monitoring.

The next figure represents the type of relations and the place of enterprise.

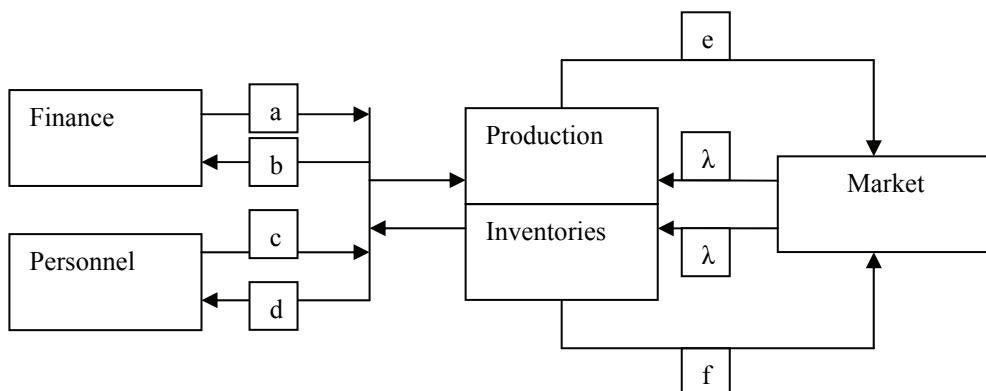


Fig.1 The overall intersystem interaction between Enterprise, Market and the main field-factors that impact the crisis appearance

Fig.1. presents the following:

-Enterprise is presented like compound system- **customer** of two subsystems- **Production** and **Inventories**. They are distinguished like that due to be outlined usage of the specific accounts of accounting systems in Bulgarian enterprises. Thereby presented here methodology is wide applicable. The “Enterprise system” places an order flows “e” and “f”, and is served by the overall incomes of sales. Enterprise “generates” the orders by:

- Production subcustomer: costs for materials, wages and depreciation.
- Inventories subcustomer: raw materials, unfinished products and output inventories.

The main serving Queuing System M/M/1 is market.

Systems of personnel and financial activity of the enterprise are presented like outer customers. The enterprise is “Queuing system” in this case. It is hardly to distinguish the distinct effect of each inner subsystem (Production and Inventories)

Queuing System type M/M/1 is very applicable to this case through next few reasons:

- Easy determining the elements of the system, taken form accounting documents.
- Let trough the admissions about times of waiting, serving, number of queues etc.
- Easy way to implement the model into some wide spread software product like Microsoft Office Access.
- Indices for system effectiveness are close to many other financial and economic ones.

The way to calculate the effectiveness is the “Probability to refuse” and the opposite one- “Probability to serve”[4]. The first is the probability any request to be refused and the second, to come into the system. The meaning of these probabilities is of threat of disproportion, and consequent precondition for crisis appearance. For the outer systems that probability is the next:

$$P_{ref-Finance} = \frac{a}{a+b}, \quad (1)$$

where a=(Long-term Liabilities)+ (Short-term Liabilities)+ (Financial Costs);
 b= (Receivables)+ (Cash and Cash Equivalents)+ (Sort-term Investments)+ (Financial Incomes)- (Financial Costs);

$$P_{ref-Finance} = \frac{c}{c+d}, \quad (2)$$

where c=Liability to Personnel
d= (Wages)

Probabilities for the inner subsystems are:

$$P_{ref-Production} = \frac{e}{e+\lambda}, \quad (3)$$

where e=(Costs for Materials)+(Wages)+ (Depreciation);
 λ - sales in value.

$$P_{ref-Inventories} = \frac{f}{f+\lambda}, \quad (4)$$

where f=Total Inventories.

RESULTS

The model presented above is tested with accounting information of Bulgarian enterprise- the biggest plywood producer in the country. Testing period is 2004-2008. Documents have been used in the research are taken from the enterprise's accounting system. They are on yearly basis. At first the model functioning is presented in Microsoft Excel and later in Microsoft Access. In MS Excel the results are presented on figure 2.

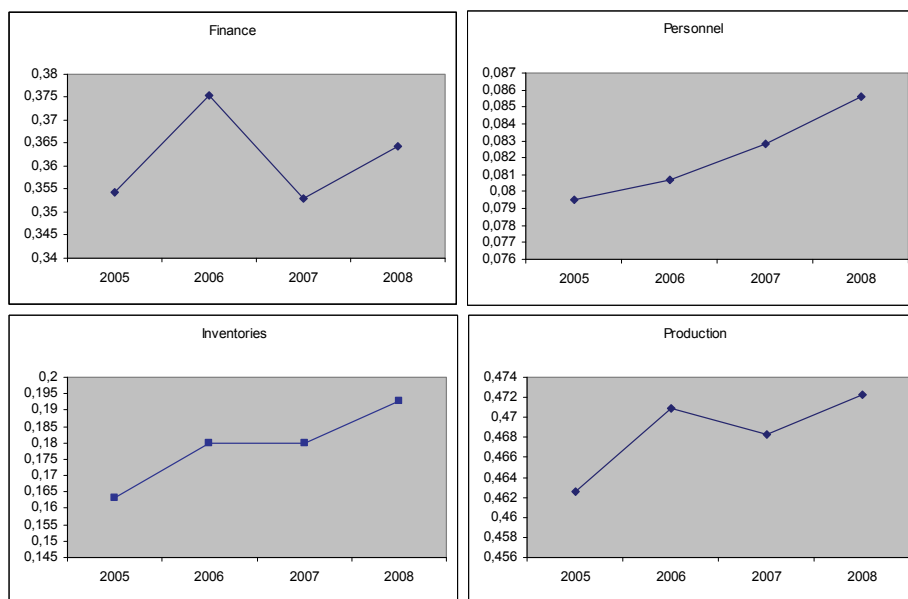


Fig. 2 Average probabilities for refuse of all customers described above

Average probabilities for refuse describe processes in the Bulgarian enterprise. They reveal appearance of premises for crisis appearance. Threats for crisis appeared firstly in

2006. For all systems, excluding Personnel 2007 is good year for the business. Personnel and Inventories reveal that crisis within the enterprise has not been interrupted. The conclusion is that the situation in 2009 (annual report generalizes negative tendentious and decreasing results) in the firm is result not only of external causes. The internal ones accelerate the effect of external. This is the reason the crisis to be so severe in some enterprises in Bulgaria. Average probabilities manage to sharp the almost invisible symptoms of latent period. They focus the attention on the management mistakes.

DISCUSSION

Application in MS Access begins with recording the accounting data into tables. They can be on yearly or monthly basis. We recommend being on second one because of easy revealing the causes for any threats. Tables are presented below in Design View.

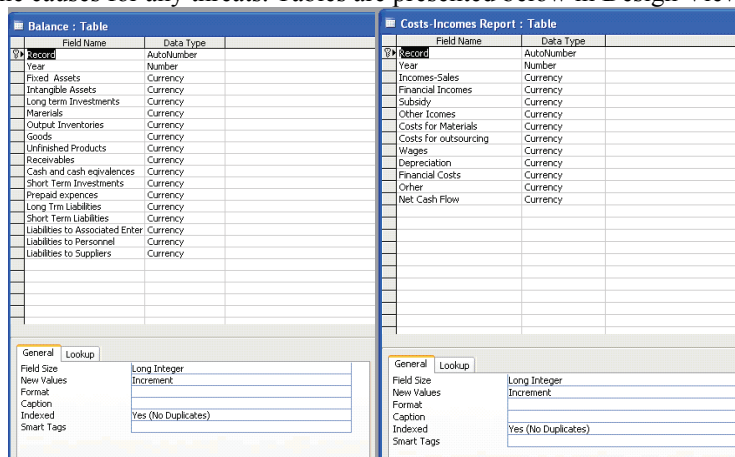
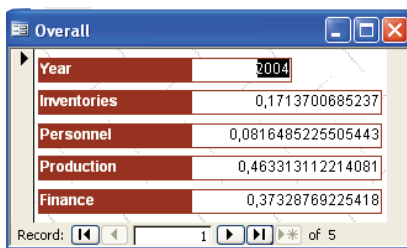


Fig. 3 Design view of tables in MS Access, which include all data from accounting documents

After table has been created, queries are main sources of information about probabilities. Data from tables is distributed into four queries: Personnel, Inventories, Production and Finance. All de calculations are put in the each query and include probability value, average probability and coefficient of its variation. Information generated in queries is integrated in next documents: Form-Overall and Report- Common. First one presents the probability in each year; second one the average probability at the end of the last year and standard deviation. Documents are shown in figure 4.

a)



b)

AvgOfProduction	AvgOfFinance	StDevOfFinance	AvgOfInventories	DevOfInventories	AvgOfPersonnel	RDevOfPersonnel	stOfProduction
0.4772978247214	0.344412121950811	0.049849229279784	0.192384296297157	0.021849523958145	0.057708294147244	0.00478957632921679	0.0117216232741

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Fig. 4 Documents used to visualize information about the current statement in enterprise, where a) is Form-Overall and b) Report- Common

Documents presented above reveal just a way to use methodology. It is debatable whether documents should look like that. Most of all they have to be simple. They have to allow to be collected and compared by every one in woodworking, who is responsible for this.

CONCLUSION

Methodology shown above is very useful and convenient for use by wide range of managers or even of self-employed owners of very small enterprises. Models reveal the crisis appearance in latent period. For the current research this appeared after 2006 or maybe before the end of this year. Inventories prove their special feature to respond very elastically to changes in both internal and external environments for the enterprise.

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