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Know how or embezzlement? Case study - model proposal of SME's financial analysis of aberrant statistical values compared to the sector's expected results.

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Abstract
We have extracted financial information for 460 small companies for a period of 8 consecutive years. The group analysis of SME's that are subject to this study has a turnover between 100k - 1M Euro.
The data analyzed displays the evolution from a financial perspective in the period 2010 - 2018 of the main economic actors operating in the local and regional trade of construction materials in Romania. The collection of financial information was performed using the software "BizZilla - Prospecting, Analysis and Market Research".
The model proposed adopts a Data Envelopment Analysis (DEA) and cross-sectional analysis in order to disclose percentiles that represent aberrant values. Using expected sectors performance, we were able to detect aberrant statistical values of computed indicators that may suggest irregularities from legal perspective or an exceptional leadership.
Our findings suggest that among the class analyzed there may be a small group of companies that benefits from external aid or are subject to other criminal activities.

Keywords: embezzlement; criminal activities; financial analysis; SME's; commercial trade

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I. Introduction

The economy represents a model of organizing and managing the economic life, based on economic-financial levers objectively determined by the supply and demand relations in which the goods and services created predominantly in the private sector, pass to consumption through the competitive market, the entire system being subordinated to obtaining profit and achieving social welfare.

The activity of any company, in a context of reform and transition to the market economy takes place in a dynamic and aggressive environment. The transition is represented by a period of organizing ideologies and concepts in their natural order, with care natural adaptation of the new structures to the requirements of the market economy in increasingly harsh conditions that are better defined (legislated).

The fundamental problems that each company faces are mainly aimed at establishing and consolidating the place it occupies in a concrete economic environment, the major objective towards which it is directed, the costs involved and the chances of surpassing competition.

In this context, the company is determined to permanently comply with the market requests. The company must anticipate the competition behavior to self-assess the resources of which disposes and must act in the direction of increasing the efficiency of their use.

In the systemic approach to the company's problems, a special role belongs to the financial analysis as a tool for monitoring its activity and performance.

Financial analysis through the methodology, procedures and specific techniques of which disposes, contributes to diagnosing the state of various processes and phenomena. It can discover the structure, establish the causal relationships, analyze the factors that govern them based on the laws of their formation and development and on this basis, offers leadership the possibility of decision adoption for improved performance.

The enterprise represents an independent socio-economic entity, with structures defined in time and space. To be viable and to be able to perform a continuous activity in their institutional environment, the enterprises enter into relations of inter-conditioning with the existing factors in the given environment, being supported in the economic approach by customers, suppliers, banks, government and budgetary institutions etc., with the declared intention to demonstrate that they are viable to achieve added value.

The delimitation of the object of study is an essential problem of any science or scientific disciplines and consists in determining the content of the phenomena they study and their sphere of action, as well as

setting the conditioning relations with the other sciences that investigate phenomena and processes in related fields of activity.

Context

The problem of management and administration of SME's, regardless of the object of activity and for the purpose proposed is a complex one. The assessment of performance differences depends on the nature of the enterprise, the system of tools used in wealth management. Establishing the place of economic-financial analysis in all economic sciences depends on its particularities in relation to the phenomena in nature. Phenomena in nature are manifested outside of the activity of people, in the socio-economic field, however processes and phenomena can take place only as a result of human factor action.

Regarding the phenomena in nature, thanks to the possibilities offered by the scientific research in the field (methods, techniques, technologies, instruments, equipment, etc.) are created the premises of observation in their internal structure by microanalysis. In these conditions, the object of the analysis can be reduced to laboratory dimensions, but without being affected the conclusions of the analysis. The particular character of the experiment in the field of phenomena from nature, has no relevance when it comes to the analysis of socio-economic phenomena. Economic analysis involves researching a phenomenon or process from economic perspective, which implies correlatively, highlighting the efforts dimensioned by consumption of material, human and financial resources, as well as delineate results as useful social values.

The internal analysis has a partial character, the ease of performing it resides from the fact that the analyst has a privileged position because he benefits from a series of information about the analyzed enterprise. Based on this information, the analyst can detect imbalances in different areas of the company's activity, as well as their causes, at the same time establishing the measures that are required in order to remedy them.

The elaboration of these analyzes serve the management of the enterprise, both for knowledge of the state of affairs reflected by the level of economic and financial performance and exercising on this basis the control regarding the way of accomplishing the tasks scheduled, as well as for the substantiation of the future activity.

Different categories of users use financial information as well as other information provided by the statistical and operational records of the enterprise in diagnosis of its activity, and on this basis to be able to substantiate its economic and financial decisions.

As a method of knowledge, analysis is peculiar to any science. As a practical activity, in order to achieve its objectives, the analysis uses a set of concepts, methods, techniques and procedures that ensure the collection, verification and processing of information. These procedures are completed in order to formulate pertinent assessments regarding the situation of an economic agent (level and quality of performance, competitiveness of products, market position, degree of performance)

Revealing the specifics of the research of the financial phenomena at the level the enterprise is likely to emphasize the primacy of qualitative analysis in relation to the quantitative study.

The complementary of the analysis is the synthesis, which defines the process by which it takes place bringing together in a unitary whole the parts and disparate elements of an object or phenomenon researched. While the analysis involves the decomposition of a phenomenon into simple elements (including the determination of structural-functional and cause-effect relationships), the synthesis consists in examining them in their unity. Full knowledge of its processes economic and financial phenomena requires the combination of analysis and synthesis in one unit, as means of knowledge.

The continuous process of improving the sciences in general and the economic-financial analysis in particular, takes place on the principles of completion. The role of financial analysis it can be considered as essential, because through its results it allows satisfaction requirements of different users.

Any strategic and financial analysis is a privileged source of information that contributes to the substantiation of users' economic decisions. According to Lauzon (1990) the activity in the economic field has repercussions on the field financially, so in the context of economic decisions, financial information serves supporting decisions related to the hiring of investment projects or contracting a credit. The financial information allows users to make the best decisions and reach the best allocation of resources.

General information regarding markets, technologies, political and social environment, complete the image on the context in which the analysis was performed.

For the proposed study based on the ratio between when the analysis is performed and the moment of the phenomenon, the methodology used was post-factum analysis.

Post-factum analysis, post-operative or activity analysis, is a tool for "supervision and regulation" of the operation of an enterprise, which involves researching its results according to causal-functional relationships and implicitly revealing the degree of achievement of the programmed objectives.

Post-factum, as a notional meaning, defines an activity, process, or event that has took place or ended, its analysis being performed after its production. Post-factum analysis proves its usefulness in the practical

activity of the enterprise by providing information on the framing or non-framing of the results obtained within the limits estimated to be normal.

The analysis of the activity looks at the present and the past, while the forecast analysis looks into the future. If we separate the present from the past, a new category can be created and namely concomitant or current analysis. This type of analysis consists of sectioning a phenomenon and involves its tracking on fragments, provided that unity is maintained. Report the analysis to each fragment followed, regardless of the fraction of time considered, brings back to the present the type of post-factum analysis.

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As a type of post-factum analysis that can be combined with prospective analysis, we mention the diagnostic analysis, which allows assessments on the economic and financial performance of an enterprise, on a structure such as its functions, on responsibility centers or a segment of the company's activity.

For the study proposed we have extracted financial information for 460 small companies that activates in the field of commercializing construction materials for a period of 8 consecutive years (2010-2018). All of the companies analyzed have a turnover between 100 k euro and 1 M euro.

The data analyzed displays the evolution from a financial perspective in the period 2010 - 2018 of the main economic actors operating in the local and regional trade of construction materials in Romania. The collection of financial information was performed using the software "BizZilla - Prospecting, Analysis and Market Research".

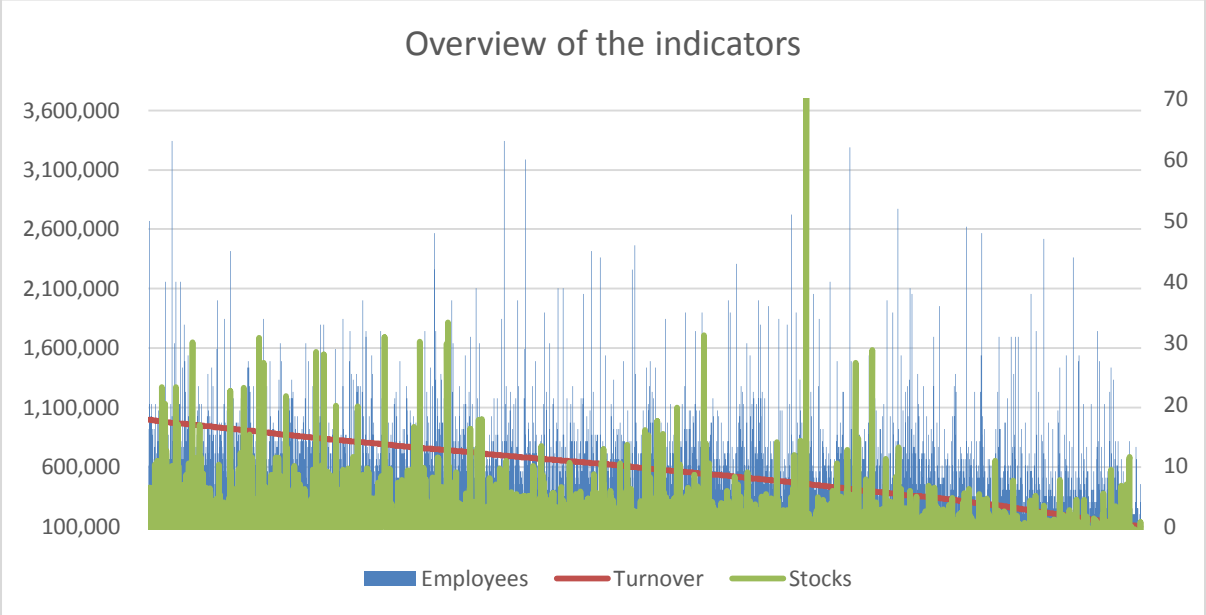
The following financial information that was collected annually is illustrated for the chosen sample: number of employees; turnover and stocks.

In other words, we can say that the proposed model will analyze a number of "i" individuals (460 companies) observed at a regular time period "t" (2010 - 2018) for the above-mentioned indicators. The sample size is represented by the function I x T x y, adding up to a total number of 11.028 observations.

A graphic representation of the indicators collected for the companies are illustrated in the figure "Overview of the indicators". On the right axis of the graph with blue color are represented the average annual number of employees for each company in a specific year. For the analyzed sample, the number of employees fluctuates between 0 and 63. The sector average number of employees for the sample analyzed is 10. In other words, the companies that have a turnover between 100k and 1M euro have on average around 10 employees.

The productivity of one employee is represented by the function: Turnover divided to Nr. of employees. The average productivity of one employee for the sample analyzed is 115k euro. This measure illustrates that one employee has the capacity to produce on average 115k euro added value for the company's turnover. Because within the sample there were observations with 0 employees, we have considered that at least one person (one employee - administrator) was responsible for the turnover.

On the left axis of the graph are illustrated the stocks and turnover for each company on a yearly basis. With a red line in descending order (left to right) from 1M Euro to 100k Euro we have represented the turnover. As we cand observe, the turnover distribution for the 360 companies for 8 years is a normal one. However, represented with a green line, the stocks distribution for these companies has some aberrant values. We are going to analyze the stock trendline in comparison to turnover and nr. of employees.



The stock line has values between 0 and 3.7M Euro with an average of 146k Euro and a median of 102k. The turnover of stocks for a period of one year is represented by the function: turnover divided to stocks. A value of one (1) represents that a company has sold its stocks during one year, one time. A value of five (5) represents that a company has sold its stocks during one year, five times. A value of 0.2 represents that a company would take five years (1/0.2) to sell its stocks.

Because within the sample analyzed there are companies with a stock value close to 0, we have selected the median value as a relevant one for the sector. The median turnover of stocks for the analyzed sample is 4.92. This represents that the sector average of stock turnover over a period of one year is close to 5 times (or has a stock to turnover ratio of 20%).

The following indicator proposed for the herein analysis is represented by the ratio between stocks vs avg. yearly employees. This indicator will help us by providing information regarding the responsibility of employees over stock and the efficiency of stock management for each employee. The resulted value would illustrate the average amount of stock that employees can manage for a specific company in a given year. We will call this indicator stocks vs nr. of employees.

Because within the sample analyzed there are companies with a stock value close to 0, we have selected the median value as a relevant one for the sector. The median value of stock to employees for the sector is 12.5k. This illustrates that on average, one employee can be responsible for 12.5k values of stocks.

We will select the 0.1% percentile of the indicators (top 5 and last 5 companies for each indicator) from the sample analyzed.

For the first indicator **Stocks/Turnover**, we will select the first 5 aberrant values in descending order form the total observations as well as the last 5 aberrant values in ascending order:

no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
2437	8	460,822	3,712,343	806%	57,602.77	0.124132445	464,042.86
3634	14	113,117	686,334	607%	8,079.82	0.164814009	49,023.84
3633	2	113,800	651,738	573%	56,899.79	0.174609478	325,868.87
3567	12	137,580	579,932	422%	11,464.99	0.237234597	48,327.65
2681	10	394,818	1,584,236	401%	39,481.76	0.249216479	158,423.57
no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
3422	-	186,134	(20,513)	-11%	186,134.02	-9.074141294	-
2149	12	527,902	(11,589)	-2%	43,991.87	-45.55093714	(965.77)
3416	6	188,085	(0)	0%	31,347.44	-912210.5394	(0.03)
3397	9	191,838	(0)	0%	21,315.28	-930412.1266	(0.02)
2654	14	401,147	(0)	0%	28,653.35	-1945562.407	(0.01)

For the second indicator **Employee productivity**, we will select the first 5 aberrant values in descending order form the total observations as well as the last 5 aberrant values in ascending order:

no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
32	-	988,451	10,144	1%	988,451.04	97.44669345	-
53	-	982,002	43,711	4%	982,002.07	22.4656135	-
125	1	965,975	-	0%	965,975.10	0	-
130	-	964,889	261,676	27%	964,888.80	3.687337518	-
139	1	963,470	19,627	2%	963,469.92	49.09001142	19,626.60
no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
3424	44	185,676	5,705	3%	4,219.91	32.54885908	129.65
3315	47	220,232	-	0%	4,685.79	0	-
3516	32	152,417	49,485	32%	4,763.03	3.080093793	1,546.39
3566	26	137,760	-	0%	5,298.47	0	-
3575	24	134,103	46	0%	5,587.64	2929.734683	1.91

For the third indicator **Turnover/Stocks**, we will select the first 5 aberrant values in descending order form the total observations as well as the last 5 aberrant values in ascending order:

no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
1573	11	647,460	1	0%	58,859.96	1,046,726	0.06
1570	12	647,600	1	0%	53,966.63	785,214	0.07
2510	9	440,510	1	0%	48,945.60	712,158	0.07
2207	13	512,064	4	0%	39,389.56	118,262	0.33
2049	35	545,275	8	0%	15,579.28	69,594	0.22
no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
2654	14	401,147	(0)	0%	28,653.35	(1,945,562)	(0.01)
3397	9	191,838	(0)	0%	21,315.28	(930,412)	(0.02)
3416	6	188,085	(0)	0%	31,347.44	(912,211)	(0.03)
2149	12	527,902	(11,589)	-2%	43,991.87	(46)	(965.77)
3422	-	186,134	(20,513)	-11%	186,134.02	(9)	-

For the fourth indicator **Stocks/nr. of employees**, we will select the first 5 aberrant values in descending order form the total observations as well as the last 5 aberrant values in ascending order:

no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
985	2	765,899	938,829	123%	382,949.59	1	469,414.54
2437	8	460,822	3,712,343	806%	57,602.77	0	464,042.86
3538	1	146,961	380,844	259%	146,961.20	0	380,844.12
2272	1	499,645	355,549	71%	499,645.02	1	355,549.07
1117	1	740,771	343,069	46%	740,770.95	2	343,069.28
no.	Employees	Turnover	Stocks	Stocks/Turnover	Employee productivity	Turnover/stocks	Stocks/nr. of employees
2149	12	527,902	(11,589)	-2%	43,991.87	(46)	(965.77)
3416	6	188,085	(0)	0%	31,347.44	(912,211)	(0.03)
3397	9	191,838	(0)	0%	21,315.28	(930,412)	(0.02)
2654	14	401,147	(0)	0%	28,653.35	(1,945,562)	(0.01)
3422	-	186,134	(20,513)	-11%	186,134.02	(9)	-

The table presented bellow illustrates the calculated results as well as the maximum and minimum values for each indicator.

	Nr. of employees	Turnover	Stocks	Stocks/ Turnover	Employee productivity	Turnover/ Stocks	Stocks/ Nr. of employees
Median	8	592,847	102,866	19%	70,865	4.9	12,515
Average	10	577,846	146,795	27%	115,829	(230.9)	20,126
Max.	63	999,847	3,712,343	806%	988,451	1,046,726	469,415
Min.	1	100,440	(20,513)	-11%	4,220	(1,945,562)	(966)

Results of the model proposal

For the series, we will analyze duplicate values using a cross section analysis for the above presented companies.

DISCLAIMER

For identification purposes and for this study alone, the unique registration code of the companies is shown in the table below. Any similarity with a unique code of a company that activates in the field is just a coincidence and not to be used by any professional for further investigation. We do not give our consent to use this study for any criminal activities nor further investigation.

Stocks/Turnover	Employee productivity	Turnover/Stocks	Stocks/nr. of employees
32323972	26822846	32345334	29483400
28452090	26220840	32345334	32323972
33498417	33851224	32345334	32139008
28452090	17656418	6162737	12305939
6892707	28589489	21393514	12305939
#N/A	#N/A	#N/A	#N/A
23572869	15628225	20573061	32741428
32741428	15628225	20573061	20573061
20573061	16897485	20573061	20573061
20573061	5000702	32741428	20573061
20573061	5000702	23572869	23572869

In the table above are presented for each indicator the unique identifier of the companies that represent aberrant values for the calculated indicators. Colored in red, are presented the unique identifier that is shown at least two times in the table using a cross-section analysis. From the table we have identify 9 unique companies that may present a risk of embezzlement. The companies that would need further analysis are the following:

32323972
28452090
23572869
32741428
20573061
15628225
5000702
32345334
12305939

II. Conclusion

In this study we examine the evolution from a financial perspective in the period 2010 - 2018 of the main economic actors operating in the local and regional trade of construction materials in Romania. The collection of financial information was performed using the software "BizZilla - Prospecting, Analysis and Market Research". All of the companies analyzed have a turnover between 100 k euro and 1 M euro.

The following financial information that was collected annually was graphically illustrated for the chosen sample: number of employees; turnover and stocks.
The proposed model has analyzed a number of "i" individuals (460 companies) observed at a regular time period "t" (2010 - 2018) for the above-mentioned indicators. The sample size is represented by the function I x T x y, adding up to a total number of 11.028 observations.
For the analyzed sample, the number of employees fluctuates between 0 and 63. The sector average number of employees for the sample analyzed is 10.
The stocks of the companies have values between 0 and 3.7M Euro with an average of 146k Euro and a median value of 102k.
The following indicators were computed for selecting the 0.1% percentile represented by the top 5 and last 5 companies of the total calculated distribution for every individual indicator: **Employee productivity, Turnover/Stocks**, **Stocks/nr. of employees, Stocks/Turnover.**
All the results were mapped in a table by using the unique identifier number of the companies and applied a cross-sectional analysis for selecting the duplicate values.
From the total number of 460 companies, we have identified nine companies that represents at least two calculated indicators within one of the eight different percentiles. This could be an indicator that the companies have received some sort of external aid or are subject to other criminal activities.

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