

## Aspects of Risk in the Defence Industry from Romania

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### Abstract

Tensions in the world economy, international migration, the rapid growth of the world's population, competition for natural resources are some of the problems that have led to the growing concern of states regarding national defence. The article proposes an analysis of the risk related to the most important companies in the Romanian defence industry. For this purpose, a process was selected based on quantitative data analysis for estimating the risk of bankruptcy. The model was applied to the Romarm Group companies, as it is the main supplier of military equipment, ammunition and maintenance services in Romania.

### Keywords

bankruptcy risk, model, defence industry, Romania

## 1. Introduction

According to article 4 of Law 232 of 2016, the national defence industry comprises economic operators, with state or private capital, who have the technical and technological, organizational and management resources necessary to achieve and supply the institutions within the National Defence System Forces or to other countries of military, sensitive and strategic products and/or related services [1]. The main producer and direct exporter of military products from Romania, the National Company ROMARM SA was established in 2000 through the merger of the most important factories of the Romanian defence industry and is the main supplier of military equipment, ammunition and maintenance services. ROMARM is a holding structure with 100% Romanian capital, under the authority of the Ministry of Economy, Trade and Relations with the Business Environment [2]. ROMARM National Company is Romania's leading supplier of military technology and services, being a constant presence in over 50 markets in countries in Europe, North America, South America, Asia and Africa. In the National Company ROMARM SA, the quality assurance system was implemented in accordance with the international standards and requirements ISO 9001 being authorized and certified by the Ministry of National Defence in Romania [3].

From the organizational point of view, the National Company ROMARM SA has subordinated 15 subsidiaries, presented respecting the order existing on the website of the Romarm group. To better track the results, the subsidiaries were numbered, following the respective order [3]: Bucharest Mechanical Plant (1), Sadu Mechanical Plant (2), Victoria Pyrochim (3), Plopeni Mechanical Plant (4), Carfil Brasov (5), Arsenal Resita (6), Mija Chemical and Mechanical Enterprise (7), Făgăraş Powder Factory (8), Dragomireşti Special Products Plant (9), Metrom Braşov (10), Tohan Zărneşti Mechanical Plant (11), Plant Cugir Mechanics (12), Ploieşti Electromechanics (13), Cugir Weapon Factory (14), Moreni Automotive Factory (15). All subsidiaries are legally organized as joint stock companies.

## 2. The Synthesis of the Subject in the Literature

The literature provides models based on quantitative analysis of accounting data such as: Altman's Z-Score [4, 5], Ohlson's Y-Score [6] and Zmijewski's X-Score [7]. Multiple discrimination analysis and probit techniques are used in estimating the Z-Score and X-Score models, while the logit technique is used in the estimation of Y-Score and others [8]. Other models are oriented towards analysing the market value of companies, this being the second direction of research orientation worldwide. [9] Most

models are developed taking into account a small number of variables [10, 11]. Starting from this shortcoming, some authors turned to a large number of statistically processed variables [12]. From the quantitative analysis techniques existing in the literature, the authors chose the model developed by economists Conan J. and M. Holder [13]. The arguments that decided in choosing the model are:

- applies to industrial enterprises;
- the number of employees in the Romarm branches is within the limits set by the authors. Such a variable does not allow it to fit into other models, such as Altman;
- the model is based on multiple aspects of financial management like all other quantitative analysis;
- the companies in the Romarm group are not listed on the Bucharest Stock Exchange [14];
- the impossibility of applying more well-known models, due to the particularities of the analysed companies.

### 3. Research Organization

The research included all the branches of the Romarm group. The stages covered were:

- choosing a reference period for establishing the risk;
- extracting information from the financial statements for each company in the group;
- calculation of rates from the risk model;
- calculation of the score for each company;
- setting the score at the group level;
- interpretation of scores for companies and general score.

The calculation of the indicators was made based on the balance sheet and the income statement, documents accessed from the Romarm website, the data being public [15 ... 29]. For the correct establishment of the indicators in the balance sheet, considering that the chosen model contains aspects related to the financial balance, the transformation of the balance sheet into the financial balance for each company in the ROMARM group was performed. Thus, all the necessary corrections were made to the balance sheets of assets and liabilities without being specified in the content of the paper.

The Conan and Holder model was established in 1979, observing a number of 31 instalments on a sample of 190 small and medium-sized enterprises, of which half went bankrupt during the period 1970-1975. As it applies to industrial enterprises with 10 to 500 employees. The model contains 5 variables (rates) assembled in the following form [13]:

$$Z = 0.24 \times R_1 + 0.22 \times R_2 + 0.16 \times R_3 - 0.87 \times R_4 - 0.10 \times R_5 \quad (1)$$

where:

$$R_1 = \frac{\text{Earnings before interest and taxes}}{\text{Total debt}} \quad (2)$$

$$R_2 = \frac{\text{Fixed capital}}{\text{Total assets}} \quad (3)$$

$$R_3 = \frac{\text{Current assets} - \text{Inventories}}{\text{Total assets}} \quad (4)$$

$$R_4 = \frac{\text{Financial expenses}}{\text{Turnover}} \quad (5)$$

$$R_5 = \frac{\text{Staff expenses}}{\text{Added value}} \quad (6)$$

In the authors' interpretation, the risk of bankruptcy depends on the value of the score, presented in Table 1 [13].

Table 1. Variation range

Score value	Company situation	Risk of bankruptcy
$Z > 0.16$	Very good	Smaller than 10%
$0.1 < Z < 0.16$	Good	From 10% to 30%
$0.04 < Z < 0.1$	Alert	From 30% to 65%
$-0.05 < Z < 0.04$	Danger	From 65% to 90%
$Z < -0.05$	Failure	bigger than 90%

#### 4. Results

The gross operating surplus represents the gross accumulation of the operating activity considering that depreciation and provisions are calculated expenses. It was established as the difference between the value added (increased with the operating subsidies) and the personnel expenses including other taxes and similar payments [30]. It is an important indicator in determining the capacity of self-financing as it represents a fundamental financial resource for the enterprise, used to maintain or increase production capacities, repayment of previously employed loans, and payment of financial expenses, income tax and dividends [31]. The total debts are the obligations of the companies in the short, medium and long term, to other participants in their economic life. They were determined by adding up the debts of less than one year with the debts of more than one year from the financial balance sheet. Table 2 presents the indicators that allowed the establishment of the  $R_1$  rate for each company. The obtained results show small positive values of gross operating surplus, and in some cases negative. Given the role of these amounts in financing the activity of any industrial enterprise, it can be concluded that the companies are dependent on borrowed financing sources or owner capital contribution. This explains the high and increasing values of the total debt for the group companies, an aspect that puts pressure on its financial balance. For an accurate diagnosis it is necessary to study the degree of debt and debt structure [31].

Table 2. The results obtained for the rate  $R_1$

Company number	Earnings before interest and taxes (RON)		Total debt (RON)		$R_1$	
	2016	2017	2016	2017	2016	2017
1	-2,969,741	-4,390,245	53,908,647	63,506,722	-0.06	-0.07
2	-5,769,997	4,691,192	82,154,415	88,375,426	-0.07	0.05
3	-563,660	-145,613	4,067,090	4,409,926	-0.14	-0.03
4	-1,951,246	-2,031,286	34,210,215	42,077,891	-0.06	-0.05
5	17,462,482	18,516,073	40,452,304	48,252,268	0.43	0.38
6	-249,762	-256,131	1,543,050	1,873,144	-0.16	-0.14
7	19,132,864	20,607,160	25,949,248	27,118,034	0.74	0.76
8	-585,636	-186,227	4,294,643	4,991,740	-0.14	-0.04
9	778,203	10,833,719	2,356,342	3,812,807	0.33	2.84
10	-1,221,761	2,458,231	67,263,282	73,096,506	-0.02	0.03
11	236,222	1,745,826	15,403,220	23,820,305	0.02	0.07
12	65,364,060	59,911,477	23,294,680	28,805,302	2.81	2.08
13	3,218,893	3,801,118	3,100,968	3,698,381	1.04	1.03
14	13,802,414	8,399,984	68,620,732	57,364,496	0.20	0.15
15	-2,993,275	-1,703,506	31,783,550	35,930,783	-0.09	-0.05

Fixed capitals are the sources of financing available to companies over a period of one year. Their purpose is to cover investments of more than one year and to pay dividends. They were determined by adding up the equity with the debts greater than one year. The total assets represent the patrimonial elements of assets used by the companies for a period of more than one year or for the operating activity.

They were determined by adding up the fixed assets with the current assets. The values recorded for  $R_2$  show a lack of homogeneity for the group companies (Table 3). While most of companies don't have

problems with covering permanent assets as recommended in the literature [30, 31], others (companies 1, 2, 10, 14, 15) have major financing problems. The negative values obtained for some of the companies are explained by negative equity that is shown in the balance sheet, as a result of previous losses. Such situations are characterized by a profound financial imbalance, being usually associated with bankruptcy. The accounting according to the Romanian legislation is kept in the national currency (RON is the official abbreviation for Romanian currency, 1 euro=4.84 lei at 26 June 2020).

Table 3. The results obtained for the rate  $R_2$

Company number	Fixed capital (RON)		Total assets (RON)		$R_2$	
	2016	2017	2016	2017	2016	2017
1	22,546,088	17,613,229	71,540,891	76,254,092	0.32	0.23
2	-10,852,186	58,421,430	141,001,007	147,701,525	-0.08	0.40
3	20,495,687	19,540,604	23,722,118	23,683,558	0.86	0.83
4	36,370,536	31,496,138	66,458,429	69,991,917	0.55	0.45
5	63,928,151	84,770,252	126,106,397	145,244,792	0.51	0.58
6	16,437,354	16,209,130	15,879,303	15,633,061	1.04	1.04
7	26,748,580	34,863,222	67,844,792	78,911,161	0.39	0.44
8	43,648,422	43,770,932	47,790,010	48,011,710	0.91	0.91
9	10,224,068	11,001,909	12,737,056	22,834,687	0.80	0.48
10	-13,350,834	-7,730,292	60,445,302	59,382,274	-0.22	-0.13
11	69,035,540	69,318,997	84,727,553	93,297,370	0.81	0.74
12	200,289,211	262,551,324	282,787,328	328,231,842	0.71	0.80
13	44,175,938	46,161,853	49,166,310	50,731,412	0.90	0.91
14	-97,908,145	-14,265,262	55,541,118	47,010,148	-1.76	-0.30
15	-25,163,796	-10,039,380	23,559,043	25,891,403	-1.07	-0.39

In order to determine  $R_3$  (Table 4) of the total of the current assets, the stocks were reduced as they have the lowest liquidity. Thus, the most liquid assets destined for the operating activity remained, which were compared with all assets. The results obtained for  $R_3$  are small, which means a small share of the most liquid assets circulating in the totality of the elements in the corporate assets.

Table 4. The results obtained for the rate  $R_3$

Company number	Current assets-Inventories (RON)		Total assets (RON)		$R_3$	
	2016	2017	2016	2017	2016	2017
1	2,176,567	2,210,209	71,540,891	76,254,092	0.03	0.03
2	7,403,857	9,759,060	141,001,007	147,701,525	0.05	0.07
3	267,495	266,419	23,722,118	23,683,558	0.01	0.01
4	4,499,807	7,543,787	66,458,429	69,991,917	0.07	0.11
5	18,179,295	32,345,980	126,106,397	145,244,792	0.14	0.22
6	247,175	234,535	15,879,303	15,633,061	0.02	0.02
7	18,684,544	16,154,850	67,844,792	78,911,161	0.28	0.20
8	867,129	908,666	47,790,010	48,011,710	0.02	0.02
9	1,926,810	11,779,519	12,737,056	22,834,687	0.15	0.52
10	2,382,588	2,480,981	60,445,302	59,382,274	0.04	0.04
11	9,250,191	17,235,744	84,727,553	93,297,370	0.11	0.18
12	139,662,458	185,582,239	282,787,328	328,231,842	0.49	0.57
13	11,852,864	13,032,089	49,166,310	50,731,412	0.24	0.26
14	28,763,792	12,125,265	55,541,118	47,010,148	0.52	0.26
15	1,313,940	2,082,559	23,559,043	25,891,403	0.06	0.08

The most significant financial expenses are related to the payment of corporate interests. In the applied model they are related to the sales of the companies resulting from the capitalization of the

activity objects (Table 5). The values recorded are as small as the small bank loans of the companies (financial debts).

Table 5. The results obtained for the rate  $R_4$

Company number	Financial expenses (RON)		Turnover (RON)		$R_4$	
	2016	2017	2016	2017	2016	2017
1	925,803	968,987	5,183,895	2,604,121	0.18	0.37
2	2,679,130	1,892,421	64,557,935	71,912,768	0.04	0.03
3	9	17	99,314	219,261	0.00	0.00
4	49,338	46,569	18,859,999	20,692,574	0.00	0.00
5	1,730,256	3,467,006	48,905,117	91,061,639	0.04	0.04
6	2	0	674,245	688,023	0.00	0.00
7	1,850,631	3,385,009	69,278,661	105,012,632	0.03	0.03
8	6,993	8,189	1,395,248	1,600,569	0.01	0.01
9	54,793	326,555	9,675,866	26,749,731	0.01	0.01
10	185,551	195,786	13,675,883	16,266,154	0.01	0.01
11	679,066	1,423,094	20,496,056	21,800,114	0.03	0.07
12	20,005,065	18,679,422	152,779,842	171,961,990	0.13	0.11
13	151,216	50,105	13,429,204	17,138,843	0.01	0.00
14	2,428,958	3,847,281	66,989,129	54,712,512	0.04	0.07
15	158	3,822	6,778,479	8,916,065	0.00	0.00

The added value represents a surplus that, the company manages to achieve over the value of the material consumption from third parties, in the current activity of the company. The added value is not separately recorded in the profit and loss account and as a result, was calculated from the production of the year increased by the commercial margin and diminished by the consumption of goods and services provided by third parties. Third-party consumptions consist of the amounts to be paid to parties who contributed to the production. In this category were added the costs of raw materials and materials, other material expenses, other external costs and external performance expenses.

Personnel expenses include labour consumption and fiscal contributions generated by them. The ratio between personnel expenses and value added represents a structure rate, which highlights the extent to which the newly created value in the company is appropriated by the human factor (Table 6).

Table 6. The results obtained for the rate  $R_5$

Company number	Salary expenses (RON)		Added value (RON)		$R_5$	
	2016	2017	2016	2017	2016	2017
1	9,717,905	10,169,343	2,161,394	699,726	4.50	14.53
2	31,495,275	33,062,727	23,310,515	35,158,317	1.35	0.94
3	2,195,370	2,427,974	-69,312	63,610	-31.67	38.17
4	8,790,717	10,091,672	5,567,258	7,387,092	1.58	1.37
5	13,173,721	17,782,472	29,711,654	36,658,266	0.44	0.49
6	1,322,145	1,390,339	291,611	315,676	4.53	4.40
7	20,814,758	30,149,384	40,014,165	50,969,896	0.52	0.59
8	5,551,106	5,767,706	422,099	487,477	13.15	11.83
9	5,477,778	7,832,658	5,355,987	18,808,108	1.02	0.42
10	4,472,126	4,910,500	2,884,521	2,596,084	1.55	1.89
11	16,714,416	18,740,768	13,666,476	16,403,032	1.22	1.14
12	40,864,691	50,935,214	107,645,076	111,859,806	0.38	0.46
13	7,077,012	10,527,574	9,799,137	12,980,906	0.72	0.81
14	28,658,054	32,404,132	41,861,887	41,078,448	0.68	0.79
15	10,722,519	11,377,290	3,720,303	4,832,951	2.88	2.35

The results obtained for  $R_5$  show relatively low added values against the background of high production costs. One of the most acute aspects found is the high salary expenses. There are few companies with a relatively fair size of wages compared to the value added (companies 5, 7, 12 and 14). For many of the companies the added value is consumed entirely and exceeded by the expenses with the personnel which makes their development difficult and creates a dependence on external capital. The assembly of the rates for the score determination, on the whole Romarm group was made in the Tables 7 (2016) and Table 8 (2017).

Table 7. Cumulative values of rates  $R_1$ - $R_5$  in 2016 year

Company number	Variables				
	$R_1$	$R_2$	$R_3$	$R_4$	$R_5$
1	-0.06	0.32	0.03	0.18	4.50
2	-0.07	-0.08	0.05	0.04	1.35
3	-0.14	0.86	0.01	0.00	-31.67
4	-0.06	0.55	0.07	0.00	1.58
5	0.43	0.51	0.14	0.04	0.44
6	-0.16	1.04	0.02	0.00	4.53
7	0.74	0.39	0.28	0.03	0.52
8	-0.14	0.91	0.02	0.01	13.15
9	0.33	0.80	0.15	0.01	1.02
10	-0.02	-0.22	0.04	0.01	1.55
11	0.02	0.81	0.11	0.03	1.22
12	2.81	0.71	0.49	0.13	0.38
13	1.04	0.90	0.24	0.01	0.72
14	0.20	-1.76	0.52	0.04	0.68
15	-0.06	-1.07	0.06	0.00	2.88

Table 8. Cumulative values of rates  $R_1$ - $R_5$  in 2017 year

Company number	Variables				
	$R_1$	$R_2$	$R_3$	$R_4$	$R_5$
1	-0.07	-0.07	0.03	14.53	4.50
2	0.05	0.05	0.07	0.94	1.35
3	-0.03	-0.03	0.01	38.17	-31.67
4	-0.05	-0.05	0.11	1.37	1.58
5	0.38	0.38	0.22	0.49	0.44
6	-0.14	-0.14	0.02	4.40	4.53
7	0.76	0.76	0.20	0.59	0.52
8	-0.04	-0.04	0.02	11.83	13.15
9	2.84	2.84	0.52	0.42	1.02
10	0.03	0.03	0.04	1.89	1.55
11	0.07	0.07	0.18	1.14	1.22
12	2.08	2.08	0.57	0.46	0.38
13	1.03	1.03	0.26	0.81	0.72
14	0.15	0.15	0.26	0.79	0.68
15	-0.05	-0.05	0.08	2.35	2.88

### 5. Results Interpretation

The score obtained for each company is shown in Figure 1. The classification of the companies in the risk categories, according to the score obtained, was achieved in Table 9 for both periods analysed. The total score was calculated as an arithmetic mean of the scores obtained by the 15 companies. The obtained values are 0.12 for 2016 and -0.335 for 2017. We note the significant reduction of the general

score, due to the evolution of the company 3. The results allow the classification of companies in the following categories, from the risk point of view:

- high degree of risk for companies 1, 2, 3, 6, 8, 10, 14 and 15 (over 90%);
- average degree of risk for companies 4 and 11 (30-90%);
- low risk for companies 5, 7, 9, 12 and 13 (less than 30%).

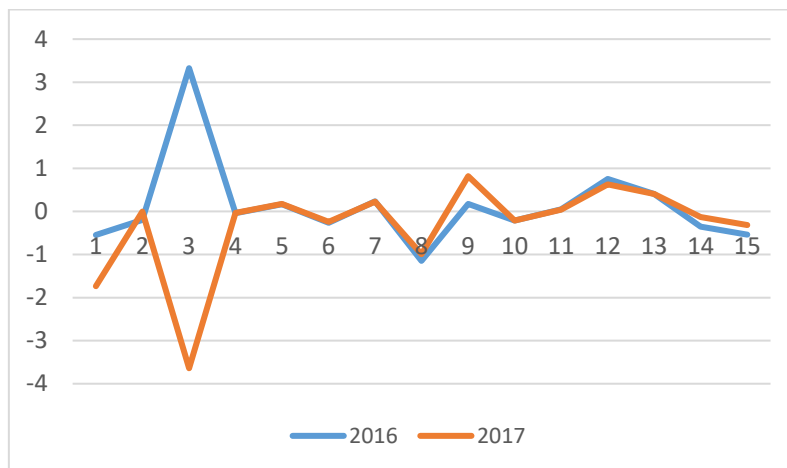


Fig. 1. Companies score during 2016-2017 period

Table 9. Bankruptcy risk level in 2016 and 2017

Company number	Variables	
	2016	2017
1	More than 90%	More than 90%
2	More than 90%	From 65% to 90%
3	Less than 10%	More than 90%
4	From 65% to 90%	From 65% to 90%
5	Less than 10%	Less than 10%
6	More than 90%	More than 90%
7	Less than 10%	Less than 10%
8	More than 90%	More than 90%
9	Less than 10%	Less than 10%
10	More than 90%	More than 90%
11	From 30% to 65%	From 30% to 65%
12	Less than 10%	Less than 10%
13	Less than 10%	Less than 10%
14	More than 90%	More than 90%
15	More than 90%	More than 90%

## 6. Conclusions

Bankruptcy risk models developed based on discriminant analysis (such as the Conan-Holder model) may be misleading because they are based on historical data. Their accuracy decreases as time passes, unless measures are taken to update the variables considered and/or to recalibrate the models. The financial rates considered may change over time, depending on the market on which the company operates. All these aspects that may affect the calculation of the risk have been considered by the authors. At the same time, the models provide a correct picture of a company's performance at any given time. For the Romarm Group, the risk was at high values and increasing during the analysed period. The group's development involves correcting the negative aspects found, capital infusion and increasing profitability.

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