

STUDY ON CREDIT RISK MANAGEMENT IN COMMERCIAL BANKS

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Abstract

Inadequate credit risk management is likely to lead a credit institution' bankruptcy. There are many techniques of this risk management some of which aimed at early warning models of depreciation loan portfolio (Credit Risk +, CreditPortfolio View, KMV etc.), while, the other part is to monitor the credit risk to the borrowers. The study undertaken proposed a credit scoring model, applied to legal entities, designed to identify their insolvency risk. The model was built based on the results obtained by 35 commercial companies (belonging to industry and production) listed on the Bucharest Stock Exchange, for a period of 3 years, between 2012-2014. Of these companies, 8 are in the default condition, meaning 23% of the sample size considered. The selected indicators express the debt repayment capacity, the profitability and the liquidity of the analyzed entities. The most relevant indicator used into the model was appreciated to be banking debt recovery term. The tests applied have demonstrated the model' validity (graininess principle, the power of discrimination).

Key words: *credit risk, credit scoring model, liquidity, profitability, banking debt recovery term.*

JEL Classification: G32

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1. Introduction

The research is focused on the quantification of insolvency risk presented by a company in a certain moment. An efficient credit risk management is realized through the credit scoring models, these minimizing the adverse impacts of the manifestation of this risk category. Banks have mainly credited to businesses, given that they can create added value economy through business conducted. However, legal entities present a much higher risk of insolvency, which lead to an inability of the company concerned to repay the accessed debt. The lack of proven effectiveness of the recovery plan and the high number of companies that trigger their insolvency procedure determined the change of the law, in 2014.

2. Literature review

In assessing credit risk shown by corporate borrowers the systems expert are most used. They were originally created to supervise the banking system. Thus, it were developed models as CAMELS rating system (derived from the CAMELS system used in the USA), SAABA (used in France) PATROL (Italy), BAKIS (Germany).

In 1990, it was created the template KMV risk assessment occurred in the loan portfolio. This model takes into account the evolution of the economic environment, trying to estimate the probability of bankruptcy. (Trenca I Benyovsky A.) Later, in 1997, other models have been developed for measuring and estimating probability of default, respectively: Credit Portfolio View, Credit Metrics and Credit Risk.

The economic crisis and bankruptcies manifested in the banking systems highlighted the importance of risk scoring systems expert assumed at the level of borrowers. The vast majority of researches has been directed towards the study of repayment capacity of debtors.

According to researchers Dardac and Moinescu, in the process of creating a rating system, the most difficult is its validation, given the fact that this involves two major aspects: the evaluation of the rating model and assessing risk elements, on the one hand and validation of the process scoring on the other.

In the table no 1, it can be found literature viewpoints regarding the selected indicators in the proposed model:

Table 1- Indicators' definition

Indicator	Calculation method	Definition
Receivables Turnover Ratio	Total receivables * 360 / net turnover * 1.24	expresses the average time between two successive receipts and measures the average commercial loan company grants (Bătrâncea, M. Și Bătrâncea, L.-M., 2006:80)
Inventory turnover ratio	Stocks * 360 / (Operating expenses - personnel expenses)	expresses inventory management efficiency (Young ,R., Yue, W.T., 2005)
Payables turnover ratio	Commercial Debts (suppliers) * 360 / (operating expenses - staff expenses) * 1.24	approximate number of days that the company obtain trade credit from suppliers creditors (Balteș N)
cash conversion cycle	the rotational speed of receivables + inventory turnover speed - rotational speed of the suppliers	Dynamic method reflects the short-term assets and liabilities and the periods in and out of cash. (Clubisco A)
Funding requirements	Cash conversion cycle * Daily Turnover	The total capital need to purchase stocks and ensuring a standardized receivables balance to determine the effective conduct of the operating cycle (Nastase G)
Liquidity	Current assets / current liabilities	Report indicates the creditors' claims short-term safety of the company in case of failure. A high value of this indicator suggests a high protection against potential losses, which could be due to insolvent. An optimal considered literature on this indicator is 2: 1 (Helfert)
Quick Test	(Current assets – stocks)/ current liabilities	indicators of the concept of capacity pay- key concept of this indicator includes testing the collection of current liabilities in the event of a major crisis, assuming that stocks held by the company have no value.
Indebtedness	Debt / Total liabilities	suggests the share of "other people's money" in total claims related to company's assets. A high level of this ratio expresses an increased risk for creditors (Helfert E.A, pg 142)
Banking debt recovery term	(Owed to commercial banks for more than 1 year + interest expense) * 360 / EBITDA	approximate number of days on which company you get to repay financial liabilities from its bank creditors (Balteș N, pg 79)
EBITDA	Operating income - operating expenses + depreciation + Provisions	Banks use this index as an indicator that can reflect whether a company has the ability to cover debts for a maximum of 1-2 years. In support of this indicator. It highlights the issue that in a way as clear operational activity due to the removal expenses not related to the business (McClure, 2006).
liquidity trend	Liquidity ₁ - Liquidity ₀	Indices Liquidity
Trend of cash conversion cycle	cash conversion cycle ₁ - cash conversion cycle ₀	cash conversion cycle evolution
Trend of	Trend of banking debt recovery	term development recovery of debts by banks

banking debt recovery term	term ₁ / Trend of banking debt recovery term ₀	
EBITDA margin	EBITDA/Turnover	This index offers to the investor the opportunity to focus on operational profitability, as one measure of performance. ⁴
EBITDA Trend	EBITDA ₁ -EBITDA ₀ /EBITDA ₀	EBITDA Evolution
Self-financing capacity	EBITDA+STOCK VARIATION +CLAIMS VARIATION- SUPPLIERS VARIATION	It is a potential monetary surplus since they are not considered payment gaps which implies that may become available cash flow only after receipts and payments were made. (Balteş N)
stock variation	STOCK ₁ -STOCK ₀	evolution stocks (In absolute amount)
Claims variation	CLAIMS ₁ -CLAIMS ₀	claims developmente (In absolute amount)
Suppliers variation	SUPPLIERS ₁ -SUPPLIERS ₀	development providers (In absolute amount)
necessary funding trend	NECESSARY FUNDING TREND ₁ - NECESSARY FUNDING TREND ₀	Evolution trend necessary financing

Source: Author's personal treatment after economic literature

Analysis of working capital (inventory turnover ratio, claims and suppliers) is likely to provide informations about the three methods that the company practices them in order to increase its performance (the trade policy – in case of claims, the stocks one and proper management of suppliers). Both literature and practice recommend that for an appropriate liquidity management, customer collection periods to be less than the negotiated payment terms to suppliers. A mismatch is likely to require short-term loans to cover the resulting gap.

The indicator „necessary funding” expresses the needed amount for a company to cover its short-term liquidity needs. Accessing a higher amount is likely to create imbalances. A negative value indicates that the company can cover its liabilities from the proceeds realized.

In the correct interpretation of the liquidity level of a company, there are situations that require the adjustment of the indicator, respectively it may be given a full attention to:

- term debt collection – in case of a significant value of claims with a high term debt collection. The role: to avoid a positive distortion of the indicator.

⁴ Informații disponibile online: <http://www.investinganswers.com/financial-dictionary/financial-statement-analysis/ebitda-margin-6447>, accesat în data de 15.03.2016

- the speed of turnover and the management policy – because an increase of the first ratio is likely to generate an improvement of the liquidity indicator. However, in order to eliminate such distortion – the quick ratio is determined. But there are businesses where the impact of this policy is zero. (example: transport sector)

- Errors in the accounting of the analyzed company. (particularly at the level of credits on short/long term – these affects in a negative way the level of liquidity ratio).

For banks a significant relevance in quantifying the insolvency risk presents the indebtedness and banking debt recovery term. Optimum recommended of this indicator is 80%, but there may be situations where companies, although they have a higher level of indebtedness, they receive free credit without jeopardizing their repayment capacity (for example, accessing credits for investments financed from grants). Concerning the second indicator, namely the banking debt recovery term, it expresses the period when the company is able to repay its bank debt accessed. A long period of time expresses a weak capacity of the companies to repay their loans.

In financial analysis, one of the most relevant indicators for expressing business profitability is represented by EBITDA margin. For this reason, in a company it is desirable that the share of EBITDA in turnover to grow. Separately analyzed, turnover does not include the situation in which it grows at a rate lower net spending increase.

3. Research methodology

In the construction of the credit scoring, it was used the heuristic metode, because in the development of the scorecard it were assigned scores to the target selected set of indicators.

The main objective of this study consists in building a credit scoring model able to identify early the insolvency risk presented by the corporate applicants and debtors. In order to achieve it, it were established the following secondary objectives:

- The analysis of the gap between the collection and payment terms, because of the negative impact of those over the company's cash and liquidity ratio.

- The analysis of the ability of companies to improve their business profitability which they practice under stress (this is suggested through the indicator - EBITDA margin).
- The study of the liquidity gaps and their coverage modalities (credit lines, credit to support current activity) – relevant indicator: necessary funding.

The research sample was represented by 35 companies, listed on the BSE, working in industry and production. Data were processed from their financial statements (public website www.bvb.ro) for a period of 3 years, respectively during 2012-2014. At the moment of the study, the sample presents the following structure:

1. 23 % of the considered companies (eight in number) were in insolvency proceedings. Of these, 2 companies have started insolvency before the period analyzed (Contor Group SA Arad and UCM Resita), 3 companies have started insolvency during the analyzed period (Concefa SA Olchim SA and company Energo Petrol SA) and 3 of them after the financial year 2014 (Amonil, Condmag and Dafora SA).
2. 77% of them performances.

The insolvency status of the companies was verified on-site Bucharest Stock Exchange (company listed / delisted), by consulting the database of the National Trade Register Office and portal.just.ro site, for verification lawsuits pending status of the 35 entities analyzed (to identify the risk requested initiation of insolvency proceedings at the request of creditors).

The explanatory variables used in the model:

The indicators, included in the model, were selected taking into account their ability to early express their appearance signals about the deterioration of companies' ability to pay. Specifically, indicators can be classified into three main groups, namely:

- Indicators meant to express the probability of default entry (turnover rates, cash conversion cycle, necessary funding, liquidity rates);
- Indicators meant to express the profitability of business (turnover, EBITDA, self-financing capacity);
- Indicators that express the ability of repayment of bank debt (recovery term debt, indebtedness).

4. Research results

In the construction model of credit-scoring, an important role was held by assigning scores based on the results, that the 35 companies analyzed have obtained. Subsequently, the companies were divided into rating categories.

Into the realised model, the most relevant indicator was banking debt recovery term, to which it was assigned the highest score (6). With a lower relevance were appreciated the cash conversion cycle, liquidity ratio, the trend followed by the term EBITDA and banking debt recovery trend. It has been awarded a maximum score of 5 points. As the obtained value of indicators is impaired, the score given decreases. Starting from the optimum indicated by literature and the obtained level of indicators at the 35 companies it was created the scale presented in Table 2.

Table 2 – Scores’ Allocation with increased relevance in the analysis of ability to pay

Nr crt	Indicator	Levels		Score
1	Cash conversion cycle (days)	0 (or less than 0)	90	5
		91	180	3
		181	270	1
		270	Above 270	0
2	Liquidity ratio	0 or negative	0,8	0
		0,81	1,2	2
		1,21	1,6	3
		1,61	Above 1,61	5
3	The banking debt recovery term (days)	negative	0	0
		0	730	6
		731	2190	4
		2191	3650	2
		3651	Above 3651	1
4	Banking debt recovery term trend	Under -180	-180	5
		-179	Greater than - 179	0
5	EBITDA trend	Greater decrease 10%	-10%	0

		-10%	Decrease or less than 10%	5
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Source: author's personal processing

For the other eight indicators, the maximum score assigned for the most favorable situation is 3, while in an unfavorable case the score is 0. To the construction of the range, allocated reasoning was kept, like the indicators with maximum relevance. The synthesis of these indicators is shown below in Table 3:

Table 3 - Assigning scores for the indicators that express payment capacity

Nr crt	Indicator	Levels		score
1	Receivables Turnover Ratio	0	60	3
		61	120	2
		121	180	1
		180	Above 180	0
2	Inventory turnover ratio	0	90	3
		91	180	2
		181	270	1
		270	Above 270	0
3	Payables Turnover Ratio	0	60	3
		61	120	2
		121	180	1
		180	Above 180	0
4	Necessary trend of financing	Under -1.000.000	-1000000	0
		-999999	999,999	1
		1.000.000	Above 1.000.000	3
5	Quick ratio	Under 0,1	0,1	0
		0,11	0,3	1
		0,31	0,5	2
		0,51	Above 0,51	3
6	Indebtedness	0	0,2	3

		0,21	0,5	2
		0,51	0,8	1
		0,8	Above 0,8	0
7	Liquidity trend	Under -0,2	-0,2	0
		-0,19	Above -0,19	3
8	Trend of cash conversion cycle	Under 30	30	3
		31	Above 31	0

Source: author's personal processing

The maximum score a company can get in a model of credit- scoring is 60 points. To assess the strength of discrimination that the model presents it was considered appropriate, the construction of 12 rating grades. After all, in literature review, power of discriminations indicates the model's ability to define ex ante default situations, to the repayment. As such, the identification of discrimination threshold is important in accuracy interpreting a credit-scoring. If this threshold value is exceeded, the model classifies the category of borrower default, while, otherwise, it will be assigned to the category of reimbursement (Dardac, Moinescu, P58). **In this case, the threshold is represented by class rating 7.** Literature regards as relevant as the used rating scale to contain at least 7 grades for non-default borrowers and at least one grade for those in default. The quality of rating scale is showed by the distribution of the borrowers in risk classes and granularity of compliance process, that, normally should avoid notes` concentration in a specific class. (Moinescu B, p25)

Table 4 – class rating

Minim	Maxim	class rating	Interpretation class rating
1	6	1	increased risk of insolvency
7	12	2	increased risk of insolvency
13	19	3	increased risk of insolvency
20	24	4	increased risk of insolvency
25	29	5	financial difficulty
30	32	6	Rising risks
33	35	7	Rising risks

36	40	8	very good situation
41	45	9	very good situation
46	50	10	very good situation
51	55	11	very good situation
56	60	12	very good situation

Source: author's personal processing

In the attempt to validate the built rating model, an important element to demonstrate was the identification of probability default outlined in each risk class. As expected, contingency table below confirms that, if the classes of high risk, probability of default is huge, while, in those with low probability of default, it is low. Borrowers classification in two categories: good or bad payers envisaged the score assigned the banking debt recovery term.

Table 5 - Distribution of the classes of risk borrowers

debtor	Class 1 rating	Class 2 rating	Class 3 rating	Class 4 rating	Class 5 rating	Class 6 rating	Class 7 rating	Class 8 rating	Class 9 rating	Class 10 rating	Class 11 rating	Class 12 rating
good payer	0	0	2	1	6	2	5	9	2	0	0	0
relisted	0	1	3	4	1	0	0	0	0	0	0	0
probability of default	0%	100%	60%	80%	14%	0%	0%	0%	0%	0%	0%	0%

Source: author's personal processing

Validation of the model lies in the fact that if in case of the eight companies under insolvency proceedings, the rating model built had the ability to predict their insolvency. Exceptionally, in the cases of the two companies, the insolvency proceeding started in spite of the improved rating. The two companies are Dafora SA and Condmag. The reasons to request their insolvency were:

- in case of Dafora SA - situation occur from the inability of rescheduling of debts to the state budget and because of the fine received from the Competition Council;
- in case of Condmag Brasov - commencement of the proceedings was due to the decrease in the honored contracts of reducing investments in oil and natural gas. To these conditions, the highest level of indebtedness and the huge losses registered in the last years were overlapped. (Financial Newspaper article dated 16/07/2015)

The others companies that are in insolvency proceedings present the following evolution of the rating:

Table 6 Evolution rating companies in insolvency

Entry into insolvency	Company	RATI NG 2014-2013	RATING 2013-2012	Evolving rating	Evolving interpretation ratings
15.03.2012	Concefa Sibiu	3	3	0	Situation remains
19.06.2015	Dafora SA	7	3	4	Positive trend
25.07.2013	Comp EnergoPetrol SA	3	3	0	Situation remains
08.12.2011	UCM Resita	2	1	1	Situation remains
05.06.2015	Amonil SA	3	3	0	Situation remains
30.01.2013	Oltchim SA	4	3	1	Situation remains
20.07.2015	Condmag SA	8	3	5	Positive trend
2011	Contor Group	4	6	-2	Negative trend

Source: author's personal processing

5. Conclusions and personal interpretation

At the level of commercial banks it is carrying out a range of traditional banking operations, namely granting loans and attracting deposits, use a credit scoring model performance can contribute directly to the increase in bank performance.

Regarding the model of credit-scoring done, it can be widely used by a bank to identify credit risk generated by companies debtor activating in

various sectors: manufacturing, gas distribution, food industry, trade in fuel, energy production and distribution.

The main objective envisaged at the establishment of credit scoring model, which is to predict entry into default (without the occurrence of exceptional circumstances) it has been reached. This derives also from the fact that, according to the model rating up, in the case of the companies insolvent before the period analyzed, their situation in terms of ability to pay does not provide for considerable improvement. According to the rating analysis and its ability to predict default entry of companies, there are a number of companies showing high signal in triggering the insolvency proceedings. These companies are included in the table below:

Table 7 - Trading companies considered high risk entry into default

Company	RATING 2014-2013	RATING 2013-2012	Evolving rating	Evolving interpretation ratings
Armatura SA	3	8	-5	Negative Trend
Grup Ind Electrocontact	3	6	-3	Negative Trend
Retrasib	4	7	-3	Negative Trend
Stirom	5	7	-2	Negative Trend
Rompetroil Well Service	5	7	-2	Negative Trend

Source: author's personal Processing

In the case of society *Armatura SA*, downgrading comes, mainly, from the deterioration of the liquidity ratio. This impairment is due to the decrease in the level of current assets, along with an increase in short-term debt. A major impact on the liquidity it has recorded by the significant increase in short-term debt (195%), while a decrease in long-term debt. This is due mainly to maturity of long-term loans, resulting in a further increase pressure on the liquidity. Decreased inventory turnover rate affected the liquidity ratio. At the level of this society it was reduced profitability identified (diminishing both EBITDA and the EBITDA margin), due, mainly, by lower operating revenue at a pace significantly higher decrease in operating expenses in conjunction with an increase depreciation expense.

Ind Electrocontact Group presents a worsening of indicators of activity (rotation speed of receivables, inventories and suppliers), a significant decline in turnover from one period to the other. The increase level of the claims impose an analysis of their maturity in order to identify if there are collection problems or a significant reliance on one customer etc.. These evolutions have influenced the liquidity, profitability and self financing capacity of the analyzed company. Therefore, to avoid default entry of this society, it requires a review of trade policy, inventory and suppliers.

To *Retrasib SA*, it was identified an inadequate management of company's activity (time collection and payment much longer and there is also payment terms correlated with the time of collection). The decrease in turnover by 32% determined, mainly, deteriorating profitability and the payment capacity of the company. Inability of quick adjustment expenses amid the drop in revenues generated losses to the entity.

Rompetrol Well presents a fall in turnover of 21%, higher net rate of decline in spending. One consequence of this trend was materialized in reducing EBITDA (54% in 2014 compared to 2013) and self-financing capacity. Also, increasing the receivables turnover ratio highlights problems in collecting the claims, imposing a detailed analysis of the time limits for collection and dependence on certain customers. Given the fact that, the company shows an increase in financing needs, it emphasizes the need for an increase in short term funds.

Stirom SA recorded a deterioration in the rating due to the fact that the liquidity ratio recorded a decrease of 23%. This is the result of the inventory turnover speed and their inadequate management policy practiced in the company. Also, at the company an increase in debt to suppliers was identified, a managerial decision which affected negatively the company, generating a widening imbalances.

The model complies with the principle graininess, due to the fact that in high risk classes, the default rate is highest. *Its power of discrimination is high.*

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Legislative Framework:

1. Basel III Agreement:
2. European Directive CRDIV/CRR
3. NBR Regulation no 5/2013 - on prudential requirements for credit institutions
4. Regulation 575/2013 of the European Parliament and the Council of Europe - on prudential requirements for credit institutions and investment firms
5. Insolvency Law no 85/2014

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