MODELING THE RATING OF ENERGY COMPANIES

Diana ANDONE [1], Gheorghe FĂTĂCEAN [2], Paul MINTEUAN [3]

[1, 2, 3] *"Babeș-Bolyai University" Cluj-Napoca*

Abstract. *The methods of bankruptcy risk measure the past performance of the economic entity, informing the managers in a small proportion on its future. Financial results can rapidly degrade over time because of the economic environment. As a reaction to these practical requirements, the diagnosis of the default risk was developed with statistic methods based on the financial ratios. The aggregate rating model which we built is based on credit - scoring methods, banking methods and an own model based on financial ratios. Then we tested the aggregate model on the energy companies CNTEE TRANSELECTRICA SA and ENEL SpA based on multiple financial criteria, we found that our model is similar with Moody's, Standard & Poor's and Fitch models.*

Key words: Rating, Scoring, Liquidity, Bankruptcy

JEL classification: G32, G33

1. Introduction

The rating of the companies is considered an important component of the financial management, when the managers take financial decisions to improve the activity. Thus, many analysts have designed and developed an assessment model of the entity's business based on score, a model that highlights the financial standing of the entity at some point in time (Csegedi, et al, 2011, p.341-347; Csegedi, et al, 2012, p.195-198).

The rating is connect in most of cases, in the regional analysis, by the indicators of income which reflect a certain level of income and the extent to which local and regional government holds control over regional and local revenues. These ratios can be used in the regional rating models based on the

[1] *PhD student, "Babeș-Bolyai" University, Cluj-Napoca, Romania, andonediana2014@gmail.com*
[2] *Associate Professor, "Babeș-Bolyai" University, Cluj-Napoca, Romania, gfatacean2006@yahoo.com*
[3] *PhD student, "Babeș-Bolyai" University, Cluj-Napoca, Romania, paul.minteuan@yahoo.com*

income statement (Bătrâncea, et al, 2013, p. 296 - 305). Modeling rating companies in general and companies in the energy industry in particular are a concern, especially the Credit Rating Analysis (CRA). Their products give signals to investors in the capital market on the direction in which the energy industry and default economy move. Therefore in this paper we built a model aggregate rating based on three levels namely own model; an aggregate banking model and a credit scoring aggregate model.

2. Literature review

The international financial crisis has prompted rating agencies such as Moody's, Standard & Poor's, Fitch IBCA and Thomson Bank Watch to prepare quarterly reports on the rating of banks, large corporations, municipalities and countries to highlight the risks posed to investors. Financial information taken from the financial statements, forecasts, investment programs and international news will form the basis of determining the assessed rating after selection and adjustment (Bătrâncea et al, 2016, p.165-173).

In a statistical research other authors studied the impact of 18 ratios based on balance sheet on the ROE changes, and concluded that it can establish multiple strong connections between these factors and ROE, based on the linear method (Bătrâncea, Bătrâncea, 2008, p.164-178). In another paper the rating analysis is based on some of the indicators used for the financial analysis. The rating analysis uses three key principles: Clear rating responsibilities, the rigorous enforcement of the „four eyes" principle in the rating process (Bătrâncea, et al, 2007, p.80 - 83). On the other hand, in the failure prediction models are met the most important financial ratios such as return on assets, asset turnover rate, leverage, liquidity, interest coverage, etc (Bătrâncea, 2011, p. 393 – 399; Bătrâncea, 2006).

Rating agencies are important components of the market competition and provide valuable credit information about 3,000 corporate most of them is located in the US. That is why some authors developed a model that tries to approximate agencies' ratings by using solely financial data (Cardoso, et al, 2013, p.51-58). Others connect the ratings to the Basle regulations, and consider that the rating analysis is based on some of the indicators used for the

financial analysis and can determine the financial soundness of the company. Before the financial crises, analysts show how to data mining techniques in the credit scoring models (Hian, et al, 2006, pp.96-118). In the same period, in another paper it studies the influence of the state of the business cycle on credit ratings and is based on a model of ratings determination that takes into account factors that measure the business and financial risks of firms, in addition to indicators of macroeconomic conditions (Amatoa, Furfineb, 2004, p.2641–2677).

3. Methodology and Results

In our aggregate model of rating we took into account the number of financial ratios of each partial model in total ratios (44):

► own rating model with a share of 16% (7/44) in the final rating;

► an aggregated model-based bank rating methodology: BCR – Erste bank, Transylvania Bank and BRD - GSG, with a share of 43% (19/44) in the final rating and

► an aggregate scoring model based on the methodologies: Altman, Stickney and Ivoniciu with a share of 41% (18/44) in the final rating.

The rating is based on the rates of liquidity, profitability and activities of companies. The rates method used in this model is a technical financial analysis of companies and is used most often in the analysis of financial standing. Ratio analysis can be used both in trend and static analysis (Moscviciov, et al, 2010, pp.600-603). At the same time, others consider that financial rates are useful tools in the rating models (Bătrâncea, et al, 2013, pp.846-856).

Based on the ratios method, we awarded five grades of risks: A, B, C, D which means: "very Good" and "good" for grade A "above average" and " the average" for grade B, "below average" for rating C," poor " for rating D and " very poor grade" for E.

Thus, our rating model is based on seven financial ratios presented below:

- Quick ratio = (Current assets – Inventories) / current debts * 100;
- Solvency Ratio = Total assets / total Liabilities * 100;
- Debt Ratio = Total debts / (Total debts + Equity) * 100
- Return on Equity= Net profit / Equity * 100

- Return on Assets = Net profit / Total assets * 100
- Gross Return on Sales = Gross profit / Net sales* 100
- Days of collection= receivables / net sales * 360

We selected the component bank rating models as models of BCR-Erste Bank (4 ratios), Transylvania Bank (10 ratios) and BRD-GSG Bank (5 ratios) because these are among the top 3 in Romania, in terms of the value of bank assets. We chose a component of scoring models Altman (5 ratios), Stickney (7 ratios) and Ivoniciu (6 ratios) which is representative for the energy industry. Then we compare the **CNTEE TRANSELECTRICA SA** and **ENEL SpA** ratings through these models and finally we aggregate the results to get the rating for each analyzed year.

In the model we awarded the scores for each financial ratio, as shown in the table below.

Table 1 Assigning scores in the rating model

Ratings	**A**	**B**	**C**	**D**	**E**
Indicators/ Points	**5**	**4**	**3**	**2**	**1**
Quick ratio	**>130%**	**>100%**	**>75%**	**>50%**	**<50%**
Solvency ratio	**>300%**	**>250%**	**>200%**	**>150%**	**<150%**
Debt ratio	**<20%**	**<30%**	**<50%**	**>50%**	**>70%**
Return on Equity	**>17%**	**11-17%**	**6-10%**	**0-5%**	**<0**
Return on Assets	**>11%**	**8-11%**	**4-7%**	**0-3%**	**<0**
Gross profit on sales	**>18%**	**13-18%**	**9-13%**	**5-9%**	**0-5%**
Days of collection	**<30**	**30-45**	**45-60**	**60-90**	**>90**
Scoring (points)	**28-35**	**21-27**	**14-20**	**8-13**	**<=7**

Source: Own calculus

After applying the rating model, the companies' situation is as follows:

Table 2 The scoring of the companies based on own model

Fiscal year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
CNTEE TRANSELECTRICA SA											
Adjusted Points	12	12	12	9	9	9	12	12	12	12	12
Ratings	**B**	**B**	**B**	**C**	**C**	**C**	**B**	**B**	**B**	**B**	**B**

ENEL SpA											
Adjusted Points	12	12	12	9	9	9	12	12	12	12	12
Ratings	**B**	**B**	**B**	**C**	**C**	**C**	**B**	**B**	**B**	**B**	**B**

Source: Own calculus

The aggregate bank generated the following guidelines set out below.

Table 3 The evolution of the ratings-based on the banking models

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CNTEE TRANSELECTRICA SA											
BCR –Erste											
Points	1,09	0,79	0,79	0,79	0,93	0,93	0,91	0,85	0,79	0,79	0,79
Ratings	D	B	B	B	C	C	C	C	B	B	B
Transylvania Bank											
Points	24	34	29	28	27	25	26	26	32	34	36
Ratings	D	B	C	C	C	C	C	C	B	B	B
BRD –GSG											
Points	35	48	46	40	38	36	39	33	48	48	48
Ratings	B	A	A	B	B	B	B	B	A	A	A
Total adjusted points	9	13	12	11	10	10	10	10	13	13	13
CNTEE TRANSELECTRICA SA Banking Ratings	B	A	B	B	B	B	B	B	A	A	A
ENEL SpA											
BCR –Erste											
Points	1,03	1,09	1,15	1,15	1,15	1,09	1,11	1,09	1,15	1,11	1,03
Ratings	C	D	D	D	D	D	D	D	D	D	C
Transylvania Bank											
Points	31	32	33	32	31	32	30	30	31	28	32
Ratings	B	B	B	B	B	B	C	C	B	C	B
BRD –GSG											
Points	32	32	30	28	25	32	29	32	32	24	32
Ratings	B	B	B	B	C	B	B	B	B	C	B
Total adjusted points	11	10	10	10	9	10	9	9	10	8	11
ENEL SpA Banking Ratings	B	B	B	B	B	B	B	B	B	C	B

Source: Own calculus

The aggregate credit scoring **CNTEE TRANSELECTRICA SA and ENEL SpA** implemented is described below.

Table 4 The evolution of credit ratings based on scoring

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CNTEE TRANSELECTRICA SA											
Altman Model											
Points	0,43	1,30	0,87	0,97	0,80	0,76	1,17	1,06	1,14	1,42	1,56
Ratings	C	C	C	C	C	C	C	C	C	C	C
Stickney Model											
Points	-36	-34	-34	-36	-25	-25	-43	-30	-34	-44	-31
Bankruptcy Probability	1	1	1	1	1	1	1	1	1	1	1
Ratings	E	E	E	E	E	E	E	E	E	E	E
Ivoniciu Model											
Points	4,59	5,65	5,27	5,02	4,85	4,70	5,09	5,18	6,04	6,36	6,50
Ratings	B	B	B	B	B	B	B	B	A	A	A
Total adjusted Points	8	8	8	8	8	8	8	8	9	9	9
CNTEE TRANSELECTRICA SA credit scoring ratings	B	B	B	B	B	B	B	B	B	B	B
ENEL SpA											
Altman Model											
Points	1,21	1,28	0,68	0,79	0,69	0,78	0,74	0,73	0,84	0,62	0,72
Ratings	C	C	C	C	C	C	C	C	C	C	C
Stickney Model											
Points	-15	-10	-12	-11	-10	-8	-7	-7	-6	-7	-8
Bankruptcy Probability	1	0,99	0,99	0,99	0,99	0,99	0,99	0,99	0,99	0,99	0,99
Ratings	E	E	E	E	E	E	E	E	E	E	E
Ivoniciu Model											
Points	5,18	5,28	5,20	5,29	5,34	5,44	5,14	5,29	5,38	5,12	5,23
Ratings	B	B	B	B	B	B	B	B	B	B	B
Total Adjusted Points	8	8	8	8	8	8	8	8	8	8	8
ENEL SpA Credit scoring ratings	C	C	C	C	C	C	C	C	C	C	C

Source: Own calculus

Next, we proceeded to the classification of each grade from three models labeled A to E, a rating category, with scores shown in the table below.

Table 5 The ratings and the scores models

Rating Models	Ratings and scores				
1. Own Model	A	B	C	D	E
Scores assigned its own model	15-13	12-9	8-6	5-3	< 3
2. Banking model	A	B	C	D	E
Scores assigned banking model	15-13	12-9	8-6	5-3	< 3
BCR –Erste model	5	4	3	2	1
Transylvania Bank model	5	4	3	2	1
BRD-GSG model	5	4	3	2	1
3. Credit scoring model	A	B	C	D	E
Scores assigned credit scoring model	15-13	12-9	8-6	5-3	< 3
Altman model	5	4	3	2	1
Stickney model	5	4	3	2	1
Ivoniciu model	5	4	3	2	1

Source: Own calculus

Ratings graded from A to E of the three partial models are taken in a general model, and the scores thus obtained are weighted in the overall pattern, with percentage with the number of total variables in the aggregate model, as follows:

Table 6 The ratings adjusted scores

Rating models and weights	Ratings and scores				
Own Model	A	B	C	D	E
Scores of ratings	5	4	3	2	1
Scores adjusted by 16%	0,80	0,64	0,48	0,32	0,16
Banking model	A	B	C	D	E
Scores of ratings	5	4	3	2	1
Scores adjusted by 43%	2,15	1,72	1,29	0,86	0,43
Credit scoring model	A	B	C	D	E
Scores of ratings	5	4	3	2	1
Scores adjusted by 41%	2,05	1,64	1,23	0,82	0,41

Source: Own calculus

Based on the scores obtained we have assigned the following ratings:

Table 7 The aggregate rating scale model

Scoring	Rating
5 – 4,75	AAA
4,50 – 4,74	AA+
4,49 – 4,00	AA-
3,99 – 3,75	A
3,74 – 3,50	BBB
3,49 – 3,00	BB-
2,99 – 2,75	BB+
2,74 – 2,50	BB-
2,49 – 2,00	CCC
1,99 – 1,75	CC
1,74 – 1,50	C
1,49 – 1,00	D
< 1,00	E

Source: Own calculus

Following the calculations aggregate rating for **CNTEE TRANSELECTRICA SA** is as follows:

Table 8 The aggregate rating of CNTEE TRANSELECTRICA SA

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Own model											
Points x 16%	0,64	0,64	0,64	0,64	0,64	0,64	0,64	0,64	0,80	0,64	0,48
Banking model											
Pointsx43%	2,15	2,15	2,15	2,15	1,72	1,72	2,15	1,72	2,15	2,15	1,72
Credit scoring model											
Pointsx41%	2,05	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,23
Total scores	4,84	4,43	4,43	4,43	4,00	4,00	4,43	4,00	4,59	4,43	3,43
CNTEE TRANSELECTRICA SA Ratings	AAA	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA+	AA-	BB-

Source: Own calculus

On the other hand the aggregate rating for **ENEL SpA** described below.

Table 9 The aggregate rating of ENEL SpA

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Own model											
Pointsx16%	0,64	0,64	0,64	0,64	0,64	0,64	0,64	0,64	0,64	0,80	0,48
Banking model											
Pointsx43%	2,15	2,15	2,15	2,15	1,72	1,72	2,15	1,72	2,15	2,15	1,72
Credit scoring model										A	
Pointsx41%	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,23
Total scores	4,43	4,43	4,43	4,43	4	4	4,43	4	4,59	4,43	3,43
ENEL SpA Ratings	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA+	AA-	BB-

Source: Own calculus

A summary of the results presented in the tables 8 and 9 shows the following:

Table 10 The summary results

Ratings	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CNTEE TRANSELECTRICA SA Ratings	AAA	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA+	AA-	BB-
ENEL SpA Ratings	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA-	AA+	AA-	BB-

Source: Own calculus

Therefore, we consider that both aggregate ratings are constant in 2006 to 2015, while in 2005 the **CNTEE TRANSELECTRICA SA** rating is "AAA". We also note that throughout in these models, it is possible to eliminate the significant differences among the companies in the market energy.

4. Conclusions and limitations of the rating model

The rating model presented above indicates both the similarities and the differences between the analyzed companies. Thus building rating models we found that in the evolution and structure of assets, **CNTEE TRANSELECTRICA SA** recorded a more favorable situation in 2005, with a higher value of total assets compared to ENEL SpA and having an accelerated growth rate. As for the structure of assets, we found that **CNTEE**

TRANSELECTRICA SA has approximately 80% fixed assets, while ENEL SpA has only 70%. The equity of both companies has an upward trend during the study period and the share capital represents 55% of the total resources in **CNTEE TRANSELECTRICA SA** case and only 20% in the case of **ENEL SpA**.

As well as this, the liquidity, solvency and performance have an impact on both companies' ratings. All these factors measured by financial ratios reflect positively or negatively in the companies' ratings.

5. References

1. *Amatoa, Jeffery, D., Furfineb, Craig, H. (2004) Are credit ratings procyclical?, Journal of Banking & Finance, Volume 28, Issue 11, November, p. 2641–2677, doi:10.1016/j.jbankfin.2004.06.005*
2. *Bătrâncea M., Bătrâncea L. (2006) Standing financiar- bancar, Editura Risoprint, Cluj-Napoca*
3. *Bătrâncea, M., Bătrâncea, L.M., Popa, A. (2007) The rating analysis of the entity, The Journal of the Faculty of Economics – Economic Science, Series ISSN: 1582–5450, Volume: VOL_II, p. 80-83*
4. *Bătrâncea, I., Bătrâncea L.M. (2008) Statistic Study of Banking Efficiency Ratios, Proceedings, International Conference on Emerging Economic Issues in a Globalizing World, Izmir University of Economics and Suny Cortland, p.164 - 178*
5. *Bătrâncea, L.M. (2011) Measuring the risk of bankruptcy in the commercial sector in Romania, The Annals of the University of Oradea, Economic Sciences, Tom XX, 2nd Issue – December, ISSN: 1582 - 5450 , p.393 – 399*
6. *Bătrâncea, I., Bechiș, L., Bătrâncea, L., Stoia, I. (2013) Ratios Method - A Way of Measuring the Local Government Performance, The Annals of the University of Oradea, Economic Sciences, Tom XXII, 1nd Issue – December, ISSN: 1582 – 5450, p.296 – 305*
7. *Bătrâncea, I., Bechiș, L., Bătrâncea, L., Stoia, I. (2013) Budget and budget execution in the Northwest region of Romania, The Annals of the University of Oradea, Economic Sciences, Tom XXII, 2nd Issue – December, ISSN: 1582 – 5450, pp.846 – 856*
8. *Bătrâncea I., Găban L., Bechiș L. (2016) Romanian County Rating Measurement. A Comparative Analysis, The USV Annals, vol.16, issue 1(23), p.165-173, 2016, ISSN:2285 – 3332*
9. *Cardoso, Vicente, S., Guimarães, André L. S., Macedo, Henrique F., Lima, Jorge C. C. O. (2013) Assessing corporate risk: a pd model based on credit ratings, Journal of Finance and Risk Perspectives, Vol. 2, Issue 1, p. 51 – 58, ISSN 2305-7394*
10. *Csegedi, S., Bătrâncea, L.M., Bejenaru, A. (2011) Standing's Place and Role in the Financial Analysis of the Economic Entity, The Annals of the University of Oradea, Economic Sciences, Tom XX, 2nd Issue – December, ISSN: 1582 – 5450, p.341-347*
11. *Csegedi, S., Bătrâncea, L.M., Moscviciov, A. (2012) A Statistical study on the IT Romanian companies performance, Economic Review, ISSN: 1582-6260, 2012, pp.195-198*
12. *Găban, L. (2015) Financing Policies in the Romanian SMEs, Ovidius University Annals, Economic Sciences Series, vol.XV, Issue 2, Constanta, ISSN: 2393 – 3127*
13. *Hian, Chye, Koh, W., Chin T., Chwee, Peng G. (2006) A Two-step Method to Construct Credit Scoring Models with Data Mining Techniques, International Journal of Business and Information, Volume 1 Number 1, p 96-118*
14. *Moscviciov, A., Bătrâncea, I., Bătrâncea, M., Bătrâncea, L. (2010) Financial Ratios Analysis Used in the IT Enterprises, The Annals of the University of Oradea, Economic Sciences, Fascicle*

- Tom XIX, ISSN 1582-5450 (in electronic format), ISSN 1222-569X (in printed format), p.600 - 603

15. *White, Lawrence J., (2009), A Brief History of Credit Rating Agencies: How Financial Regulation Entrenched this Industry's Role in the Subprime Mortgage Debacle of 2007 – 2008, Mercatus on Policy, George Manson University*