

“BABEȘ-BOLYAI” UNIVERSITY CLUJ-NAPOCA

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

PH.D. THESIS

**EQUILIBRIUM AND FINANCIAL
PERFORMANCE OF COMPANIES IN THE
ENERGY INDUSTRY. AN INTERNATIONAL
COMPARATIVE APPROACH**

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KEYWORDS: financial equilibrium; financial performance; ratio system; stability; credit scoring; banking methods; rating; comparative analysis; energy industry

INTRODUCTION

Joan Robinson, a prominent representative of the Keynesian economics, stated that “an economy may be in equilibrium from a short-period point of view and yet contain within itself incompatibilities that are soon going to knock it out of equilibrium“. Indeed, according to economic theory, an equilibrium state is temporary, fragile and difficult to maintain. Nevertheless, economic and financial analysis offers companies numerous instruments and efficient methods through which financial equilibrium and financial performance can be attained in the short and long run.

From this perspective, the Ph.D. thesis named “Equilibrium and financial performance of companies in the energy industry. An international comparative approach” aims to offer economic agents operating on energy markets at international level practical and original solutions through which company performance and financial equilibrium be transformed from goals into reality.

The propensity for analyzing companies in the energy industry is motivated by the impact the expansion of this industry has triggered on the evolution of global and national economies. As stated by Maizar Rahman, Indonesian governor acting for OPEC’s Secretary General¹, in his speech delivered in 2004 in Vienna during the Tenth International Financial and Economic Forum, resources such as oil and natural gas represent the “engine of the world economy”. Considering that the industrial production had increased 50 times over the last century, and 80% of this increase has been registered in the second half of the century, global energy consumption has registered spectacular levels. According to predictions at that time, oil was used for generating 40% of global energy, while natural gas for generating 23% of global energy.

Structure of the Ph.D. thesis

The four chapters of the Ph.D. thesis bring forward the topic of equilibrium and financial performance via numerous methods that economic agents can implement in order to achieve financial stability and to increase their credibility in the eyes of internal and external stakeholders.

¹ https://www.opec.org/opec_web/en/900.htm (Accessed 12.02.2017).

The *first chapter*, called “The system of financial reporting – Data source for assessing company equilibrium and financial performance”, highlights in detail the characteristics of annual financial reporting of companies in the energy industry, according to International Accounting Standards (IAS), International Financial Reporting Standards (IFRS), IV and VII Directives of the European Union and current Romanian legislation. Therefore, the chapter presents the importance and role of the main elements of annual financial reporting: balance sheet, income statement, cash flow statement, changes in owner’s equity statement, explanatory notes to the annual financial statements.

The *second chapter*, called “Exhibits of the financial equilibrium types of companies in the energy industry”, tackles the notion of equilibrium from the perspective of different scientific fields such as chemistry, physics, psychology, economics and focuses on the concept of financial equilibrium, specifically on its content, characteristics and functions. Starting from the extensive literature, it describes the concept of short-term and long-term financial equilibrium, along with the principal liquidity and solvency indicators. The chapter includes multiple econometric analyses on financial data regarding the period 2007-2017 obtained from 30 companies in the energy industry operating at national and international level. According to results, there are strong relationships between liquidity ratios, solvency ratios and different independent variables.

The *third chapter*, called “Financial performance of companies in the energy industry”, presents details regarding the advantage of using ratio analysis methods when evaluating the financial efficiency of companies in the energy industry. Using the indicator Earnings Before Interest and Tax (EBIT) in addition to cash flows, I have built numerous financial performance indicators. Likewise, using the same sample, I have tested the degree to which the statistical relationships between performance ratios and liquidity ratios, respectively solvency ratios are significant. According to econometric analyses, there is a bi-univocal relationship between performance and equilibrium.

The *last chapter*, called “Rating – Consequence of company equilibrium and performance”, focuses on the concept of *rating* and its importance for financial equilibrium and capital drawing. It presents both rating models of the most important worldwide rating agencies (Standard & Poor’s Global Ratings, Moody’s Investors Service, Fitch Ratings) and various methods for modeling rating through credit scoring and banking models. This chapter includes the original contribution of the Ph.D. thesis, consisting of the elaboration of a complex model of rating

starting from three components: 1) an own rating model, called “Andone model”; 2) an aggregated model of credit scoring, which includes the classical Altman, Stickney and Ivoniciu models; 3) an aggregated banking model, which includes the BCR-Erste, BRD-GSG, Banca Transilvania models. Following the econometric modeling, I have found that there was a significant relationship between the complex rating model, regarded as dependent variable, and the „Andone model”, the aggregated credit scoring model and the aggregated banking model, regarded as independent variables.

Originality of the scientific endeavor, contribution to the literature and research methodology

The originality of the scientific endeavor consists in that, to the best of my knowledge, this is the first extensive study performing a comparative analysis of a considerable number of companies from three sectors of the energy industry at international level, namely oil, natural gas and electric energy.

The proposed rating models also represent original and relevant contributions, which substantially enrich the literature in the field of economic and financial analysis. Therefore, “Andone model” is a performant analysis instrument, built on seven indicators of liquidity, solvency, indebtedness, performance and company activity. The complex rating model is designed in order to assess all essential aspects related to equilibrium and financial performance. In this regard, the consideration of banking rating enhances the applicability of this model for companies in other activity fields, which aim at successfully accessing short and long-term funding. In addition, the rating categorization of the complex model resembles the categories used by international rating agencies, especially the one favored by Standard & Poor’s Global Ratings.

As previously mentioned, the sample includes 30 companies at national and international level, pertaining to three different sectors in the energy industry, that is oil, natural gas and energy industry. Companies operate in different countries from North America, South America, Europe and Asia.

The selection of the companies included in the sample was conducted according to the following criteria. The first criterion consisted in identifying the sectors of interest in the energy industry. The second criterion consisted in the random selection of companies operating on international markets for each sector, with the help of the Microsoft Excel 2016 spreadsheet. As support, I employed the rankings of the first 100 companies provided by *Thomson Reuters* and

*Value.Today*². Moreover, considering that this Ph.D. thesis includes an international comparative approach, and this research was conducted at a Romanian university, the third criterion consisted in the selection of companies operating in Romania. Therefore, I used the internet webpages „energynomics.ro“, „capital.ro“ and „listafirme.ro“ to obtain the necessary information about the Romanian energy companies.

Finally, I selected 10 companies for every energy sector. In terms of the electric energy and natural gas sectors I chose 8 foreign companies and 2 Romanian companies. As for the oil sector, I chose 9 foreign companies and one Romanian company.

Company financial data were retrieved from the annual balance sheets and income statements for the period 2007-2017. These elements of annual financial reporting are considered *additional documentation materials* and are available in electronic format. The eleven-year time frame was selected so that to also capture the impact of the global financial crisis on the equilibrium and financial performance of these companies.

Concerning the analysis methodology of financial data, besides using elements of descriptive statistics, econometric models estimating the relationships between variables of interest were built and tested with the fixed-effect Panel Least Squares (PLS) method, due to the panel data. The statistical software employed was EViews version 9.0.

Literature review

The thesis content was developed after a thorough documentation process, based on several books and articles from the international and national literature, international accounting standards and financial reporting, European Union directives, national legal regulations. Therefore, the following sources were consulted:

- *Financial reporting system*: Bătrâncea *et al.* (2010); Ciobanu (2002); Dănescu (2003); Epstein and Mirza (2005); Jianu (2007); Petre (2013); Pântea *et al.* (1987);
- *Types of financial equilibrium*: Ana (2001); Adochiței M. and Adochiței A. (1993); Adochiței and Negrea (2001); Antoniu *et al.* (1993); Arens *et al.* (2000); Babe (1979); Basno, Dardac and Floricel (1995); Bernard and Colli (1994); Brăilean (1998); Cojocaru (1997); Coteanu, Seche and Seche (1998); Crețoiu *et al.* (1993); Cristea and Ștefănescu

² I used the following webpages: <https://www.thomsonreuters.com/en.html>; <https://www.value.today/>.

(1996); Dobrotă (1992); Duran V. and Duran D. (2001); Eros-Stark and Pântea (1999); Gaskin (1998); Gheorghiu (2004); Giurgiu (1995); Hada (1999); Hermanson, Edwards and Maher (1992); Kirițescu (1982); Kregel (2011); Marin and Puiu (1993); McNamara (1988); Mihai (1997); Mihai *et al.* (1999); Niculescu (1997); Ohlson (1980); Onofrei (2004); Popa *et al.* (1996); Popescu (1993); Radu (1999); Stancu (2004); Tabără and Horomnea (1995); Todea *et al.* (2005); Toma (1994); Toma and Brezeanu (1996); Trenca (1997, 2005); Vasile (2006); Vintilă (1997, 2006); Văcărel (2000); Văcărel *et al.* (2000);

- *Financial performance*: Backer, Elgers and Asebrook (1988); Halpern, Weston and Bringham (1998); Dahiyat (2016); Janjua *et al.* (2016); Niu, Yue and Jiang (2008); Martínez-Sola, García-Teruel and Martínez-Solano (2014); Rahman (2017); Penttinen, Rummukainen and Mikkola (2010); Safdar *et al.* (2016); Yang (2005); Yee and Cheah (2006);
- *Rating*: Altman (1968, 1970, 1983, 1995); Altman and La Fleur (1985); Altman and Hartzell (1995); Altman, Hartzell and Peck (1995); Altman and Hotchkiss (2006); Altman and Rijken (2011); Altman *et al.* (2010); Aziz, Emanuel and Lawson (1988); Batbayar, Boldbaatar and Enkh-Amgalan (2017); Cybinski (2018); Danovi and Quagli (2008); Dardac and Barbu (2006); Ișfănescu *et al.* (1996); Koch (2001); Largay and Stickney (1980); Lo (1986); Marco and Vareto (1994); Martin (1977); Minetos (1994); Ohlson (1980); Shih, Cheng and Wang (2011); Stancu (2007); Stickney (1996); Teodori (1989); Todea *et al.* (2014a); White *et al.* (1998); Zavgren (1985); Zhang, Altman and Yen (2010).

CHAPTER 1. THE SYSTEM OF FINANCIAL REPORTING – DATA SOURCE FOR ASSESSING COMPANY EQUILIBRIUM AND FINANCIAL PERFORMANCE

The activity of every company includes material and financial flows, which reflect the manner of managing company patrimony during the reporting period. This managing manner, which gives content to financial reporting, is statically reflected in the balance sheet through some inventory elements and is dynamically reflected both in the income statement and cash flow statement. The efficiency or inefficiency of the activity carried out during the reporting period is reflected in the income statement, while the company financial policies that emerge through financial decisions are reflected in the cash flow statement. At the same time, transforming statistical data in dynamic data on shareholders' wealth is reflected by the changes in the owner's equity statement. This statement offers shareholders additional data on the subscribed capital, bond premiums, the manner of establishing and using reserves, reported result, etc.

The importance of annual financial reporting resides in the fact that it must offer an accurate image on the company financial position, performance, changes in the owner's equity and cash flows during a fiscal year. To offer an accurate image, I believe that the information included in the financial statements should meet a number of criteria:

a) to be relevant for decision-makers needs; namely to provide real information on past, present and future events included in the company financial forecasting;

b) to be credible, namely:

- to correctly reflect the company financial position;
- to indicate the economic content and juridical form of economic transactions. The economic prevalence over the legal assumes that information be registered and presented in accordance with their substance and economic reality, not only with their juridical format;
- to be neutral (unbiased), without influence from managers and shareholders;
- to be prudent, so that to avoid situations in which assets and income be overestimated or debts and expenditures to be underestimated;

- to reflect complete information under all significant aspects;
- to be comparable, namely information must offer the possibility of comparing financial statements in order to identify trends in the company financial position and performance.

The current general framework of developing and presenting financial statements stipulates five reporting statements: balance sheet; income statement; changes in the owner's equity statement; cash flow statement; explanatory notes to the annual financial statement.

If the balance sheet presents the patrimonial changes during two consecutive periods, the income statement shows the efficiency of operating and financial activities carried out during the reporting period. At the same time, the cash flow statement tells investors about assets' capacity of generating cash flows, while the changes in owner's equity statement highlights the manner of distributing income following shareholders' decisions, which have been put into practice through managerial decisions. Explanatory notes to the annual financial statements contain additional relevant information for users' needs regarding the company financial position and outcomes. The elements included in the four financial statements have to be explained through an explanatory note.

CHAPTER 2.

EXIBITS OF THE FINANCIAL EQUILIBRIUM TYPES OF COMPANIES IN THE ENERGY INDUSTRY

The chapter tackles the equilibrium concept, focusing on the financial equilibrium, namely on its content, characteristics and functions.

Company economic and financial equilibrium can be revealed through a correlation system that establishes certain proportionalities between different cash flows. Moreover, equilibrium is a premises and a consequence when a company normally operates its activity according to the activity object.

Financial equilibrium reflects the equivalence between financial resources necessary for achieving objectives and actual possibilities of obtaining these resources (i.e., public or private financial funds, established as final funds or reimbursable funds).

Therefore, an appropriate definition for the financial equilibrium could be the following: *Financial equilibrium designates that state of value within an economy characterized by certain conformity (correspondence, harmony), reflected through a system of correlations between the need for monetary resources involved in attaining some goals and actions, deemed as efficient, from a micro or macrolevel and the actual possibilities of obtaining monetary funds with minimum risks and costs.*

Financial equilibrium of a company must underline statically and dynamically the ways of funding and using financial resources depending on the business goal, by positioning equilibrium ratios within the variation limits of the sector where the company operates. Therefore, *financial equilibrium* has to emerge from the correlation *resources-needs* via the efficiency of company activity (profit) and via *activity viability* (capacity of generating cash and cash equivalents).

Based on the literature, the characteristics of short-term and long-term equilibrium were presented, along with the most representative liquidity and solvency indicators recommended by professionals. In our opinion, liquidity is a state of financial equilibrium that expresses the short-term payment capacity of a company by synchronizing cash input and output during the fiscal year.

Hence, liquidity state is linked to the company *operating cycle*, which is the time frame between the purchase of raw materials, transformation of final products into cash or any financial instrument that can be converted into cash.

Solvency is a main factor in the analysis of company financial statements. Solvency refers to a company's long-term viability and its ability of meeting long-term obligations. All company activities (financial, operating, investment) influences the company solvency. One essential component of solvency analysis is capital structure, which encompasses the company financing sources and its economic attributes.

The applicative section of this chapter includes numerous econometric analyses conducted on financial data retrieved from annual financial statements of the 30 companies from three sectors in the energy industry (i.e., oil, natural gas and electric energy). Making use of regression analysis via the Panel Least Squares (PLS) methods with fixed effects, several econometric models built around different liquidity and solvency ratios were tested. Results indicated the existence of strong statistical links between liquidity ratios, solvency ratios and different independent variables included in the analyses (i.e., fixed assets turnover, current assets turnover, inventory turnover, accounts receivable turnover, debt-to-supplier turnover, owner's equity turnover).

CHAPTER 3.

FINANCIAL PERFORMANCE OF COMPANIES IN THE ENERGY INDUSTRY

Operations carried out by a company, which reflect its activity, require investments both in current assets (inventory, accounts receivable) and fixed assets (property, plant, equipment, land). The indicator capturing company activity describes the existing relationship between the operation volume (seldom defined by sales volume) and the assets necessary for supporting operating activities. The more this indicator has a greater value, the more efficient company operations are, due to the fact that fewer assets are needed to maintain a certain operation level (sales).

The evolution of such indicators and the comparison of the company with other agents in the same industrial sector can reveal different threats or opportunities. Moreover, although these indicators do not directly measure performance or liquidity, they are fundamental factors influencing performance indicators.

An important component of the financial analysis system regarding energy companies is represented by the performance analysis using financial ratios.

Investors are preoccupied with the company ability to generate, maintain and increase profit. Performance can be measured in different but independent ways. First, one has to consider the company profit generated by sales, namely Return-On-Sales (*ROS*) of one leu (Euro/dollar). Other ways of assessing performance are Return-On-Assets (*ROA*), Return-On-Equity (*ROE*) and Return-On-Investments (*ROI*). Furthermore, one can also consider performance ratios determined based on cash flows in order to show the importance of obtaining cash for company activity. I specify that I added *EBIT* (“Earnings Before Interest and Taxes”) to the category of performance ratios (*ROA*, *ROE*, *ROS*, *ROI*) instead of net profit (“Earnings After Tax” or *EAT*) because the majority of companies from oil, natural gas and electric energy sectors draw up the income statement after distributing net profit in accordance with the decision of the general shareholders assembly. Hence, net profit reported in this annual financial statement equals zero.

This chapter captures the importance of using ratios method in analyzing company performance in the energy industry. In this regard, performance indicators were built starting from *EBIT* and cash flows, because these indicators are more efficient in assessing company performance. Moreover, via estimated econometric models, it was shown that a strong relationship between performance ratios and liquidity ratios, respectively solvency ratios existed, using the same 30-company sample in the energy industry and the same 11-year time frame. Thus, this empirical research indicated that it existed a bi-univocal relationship between performance and equilibrium, meaning that equilibrium influenced performance, which in turn shaped the rating of the companies in the oil, natural gas and electric energy industries.

CHAPTER 4.

RATING – CONSEQUENCE OF COMPANY EQUILIBRIUM AND PERFORMANCE

The chapter introduces the concept of *rating* and presents in detail its relevance for any company interested in maintaining financial equilibrium and increasing financial performance that ensures attracting funds from credit institutions and stock market investors. Using the literature and current banking norms, it briefly presents the models of the main worldwide rating agencies, i.e., Standard & Poor's Global Ratings, Moody's Investors Service, Fitch Ratings and various methods for establishing rating through credit scoring models (Altman, Stickney, Ivonicu) and banking models (BCR-Erste, BRD-GSG, Banca Transilvania).

In addition, the chapter brings forward the original contribution of this Ph.D. thesis, which is represented by the development on a complex rating model with three main components:

- 1) an own rating model called the "Andone model";
- 2) an aggregated credit scoring model, built on the Altman, Stickney and Ivonicu models;
- 3) an aggregated banking model, built on BCR-Erste, BRD-GSG, Banca Transilvania models.

The complex rating model was applied on the financial data of the 30 companies from the energy industry. Furthermore, by means of an econometric study conducted on the same sample, the link between the complex rating model and Andone, BRD-GSG, BCR-Erste, Banca Transilvania, Altman, Stickney, Ivonicu models was tested. According to results, the complex rating model was validated on both the overall sample and on each energy industry sector (oil, natural gas, electric energy).

CONCLUSIONS

The Ph.D. thesis with the title “Equilibrium and financial performance of companies in the energy industry. An international comparative approach” is structured into four chapters and tackles the topic of equilibrium and financial performance in one of the most dynamic sectors of the economy. Considering the increase of energy consumption at global level, the exponential increase of production and the decrease of energy resources, the present research may offer viable solutions regarding the possibility of increasing the efficiency of companies in the global energy industry.

With the proposed the “Andone” model and the complex rating model, I deem that this Ph.D. thesis brings important contributions, enriching the literature in the field of economic and financial analysis. To begin with, the “Andone” rating model is performant because it includes both indicators of liquidity, solvency, indebtedness, performance and one indicator regarding company activity. Second, the complex rating model is performant because it captures all aspects related to company equilibrium and performance, being developed after a multicriterial and multiprocedural endeavor. Last but not least, the complex rating model has a strongly applicative side because it also includes the banking component, which is essential for companies interested in obtaining short and long-term financial resources.

According to the American producer and TV director Debbie Allen, “out of limitations comes creativity”. Indeed, complex scientific studies are always a source for new creative approaches, sophisticated methods and apposite economic implications. A first limitation of the present Ph.D. thesis resides in that econometric analyses were conducted employing financial data from 30 national and international companies. In order to continue this study, possible research directions could include expanding the sample of energy companies to a larger number of entities operating on international markets or even using a representative sample established through specific methods. In addition, future studies could focus on other industries with major impact on the world economy like the IT industry (e.g., equipment, software, artificial intelligence, social media), automotive industry (e.g., self-driving cars), food industry or financial services industry.

The second limitation stems from the fact that the sample includes companies originating from countries in North America, South America and Europe (the majority). With a sole exception

(i.e., Malaysia), the sample did not consider companies of great oil, natural gas and electric energy producers from areas like Africa (Algeria, Angola, Egypt, Nigeria), Asia Pacific (Australia, China, India, Indonesia) or the Arabic Peninsula (Saudi Arabia, United Arab Emirates, Kuwait).

The third limitation resides in that the analyzed time frame considers the decade after the beginning of the world financial crisis (i.e., 2007). By estimating econometric models for a period of at least two decades (1998-2017), one could offer a clearer image of the financial position dynamics of companies in the energy industry under the impact of the financial crisis (captured through fixed effects).

From a methodological perspective, starting from the relationships tested in this Ph.D. thesis, future research could estimate econometric models that also include assets structure ratios and liabilities structure ratios. In the end, the rating developed on the “Andone” model and the complex rating model might also include aspects regarding the degree in which companies contribute to the achievement of the 17 Sustainable Development Goals (SDG) set in 2015 by the General Assembly of the United Nations (i.e., affordable and clean energy; industry, innovation and infrastructure; responsible production and consumption; decent work and economic growth; sustainable cities and communities; reduced inequalities; climate action).

According to the report prepared by IFC, IPIECA and UNPD (2017: 1), companies from the oil and natural gas sectors have an essential impact on sustainable development for they: a) facilitate access to energy resources, which represent the catalyst of economic activities and social development; b) support technology progress via massive investments in research-development; c) substantially contribute to the long-term development and success of communities where they operate; d) monitor the impact of manufacturing and distribution operations, emphasizing essential aspects like environment protection, health and safety of the workforce, human rights protection, capitalization of alternative energy sources.

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