

The Performance of Energy Firms in Greece

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Abstract

In this paper, we investigated empirically the financial performance of energy firms in Greece for the time period 2012-2015 with the use of the well-known Altman test. The results indicated that all firms in the energy industry are financially distressed and are characterized by lack of liquidity, low productivity and high leverage for the whole time period under examination. This means that there is a clear danger of oligopoly formation in the energy market, with its negative outcomes in prices and energy provision stability. Certain policy measures are needed in order to obtain more sustainable and consumer-friendly results.

Keywords: Financial performance, oligopolistic competition, Altman test.

Introduction

In recent years Greece has undertaken a well-structured and detailed process, ordered by the European Union (EU), to reform its energy sector in three key directions (European Commission, 2010). First, in order to enhance the role of renewable energy sources. Second, in order to limit its energy dependence on foreign sources and enhance its energy interconnections with other EU member states. And third, to increase competition in the energy sector under the dictation of the EU commission.

The third target aims to increase competition in the energy sector following EU guidelines, orders, and directives. EU, in its turn, followed well known neoclassical economic dominant thoughts after 1980, where, in the place of the after war unanimity in favor of publicly regulated or owned energy monopolies, there was a complete course reverse in favor of competition (e.g. Peltzman, 1976; Bishop and Kay, 1988; Vickers and Yarrow, 1991).

Here there is also a good reform ground if it delivers (especially smaller prices for consumers, avoiding oligopoly, energy provision crises, etc.). In this paper, we will restrict our interest in the above mentioned third target of the recent energy reforms. In passing we can say for the first two targets that although they are well purposed, perhaps they are not perfectly temporally structured for Greece, since they imply higher prices and increased investments in the energy sector, thus depriving the economy of scarce resources when manufactory investments were almost annihilated during the 10 years' crisis.

The Energy Sector in Greece

Electricity in Greece reached in 1889. The "General Contractor Company" constructed the first power plant in Athens. The first building that was illuminated was the Palace. Ten years later, multinational electricity companies are emerging in Greece. The American company Thomson-Houston, with the participation of the National Bank, established the "Greek Electricity Company", which undertakes the electrification of large Greek cities. Until 1929, 250 cities with a population of more than 5,000 will be electrified.

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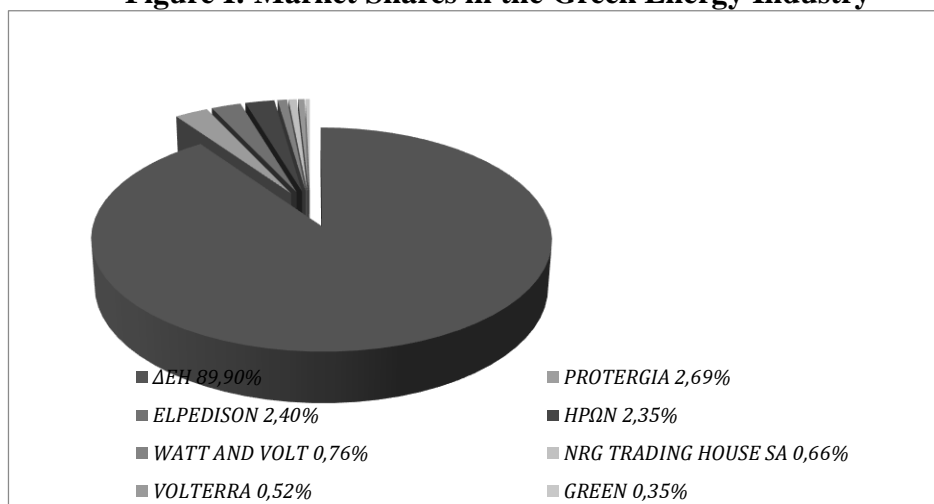
In the more remote and sparsely populated areas where the construction of power plants was economically unprofitable, electricity is provided by private or municipal and communal authorities, building small factories. Thus, in 1950, there were approximately 400 electricity generating companies in Greece. As primary fuels were used oil and coal, both imported from abroad. The fragmentation of electricity production in many small units combined with imported fuels has exacerbated the price of electricity to three times as high as five times the prices in other European countries, making electricity a luxury asset.

In August 1950, Public Power Corporation (PPC) was established, having full responsibility for the generation, transmission and distribution activities of electricity in Greece. PPC focused on the utilization of domestic energy sources and started the integration of electricity transmission networks into a national interconnected system. The rich lignite deposits of the Greek subsoil began to be mined and used as fuel in the lignite power plants that PPC created. At the same time, the Company started to exploit the power of the water, constructing hydroelectric power stations in the big rivers of the country.

PPC continued to hold a monopoly position in the electricity market until the adoption of Law 2773/1999, which established the liberalization of the electricity market in Greece. Despite the passage of the aforementioned law and efforts to bring it into line with the European Community directives, the entry of new businesses into the energy sector was limited due to PPC's dominant position in Greece.

PPC began to lose significant market shares since the beginning of 2016 reaching 89.9% in December of 2016, followed by Protergia holding 2.69%, ELPEDISON with 2.40%, the Group HERON with 2.35%, Watt and Volt with 0.76%, NRG Trading House SA with 0.66%, Volterra 0.52% and Green with 0.35% (HERON II Station of Viotia, 2017).

Figure I: Market Shares in the Greek Energy Industry



(Source: HERON II, 2017)

The Altman Z-Score

The Altman model was proposed in 1968 by Edward Altman. The model is based on findings from 66 manufacturing firms, half of which went bankrupt between 1946 and 1965, while the other half were successful. Altman investigated 22 analytical ratios that could be useful for predicting possible bankruptcy. He classified these variables into five standard ratio categories: liquidity, profitability, leverage, solvency, and activity. The original Z-Score had the following form:

$$Z = 1,2X_1 + 1,4X_2 + 3,3X_3 + 0,6X_4 + 1,0X_5,$$

Where

X_1 – Working Capital/Total Assets

X_2 – Retained Earnings/Total Assets

X_3 – Earnings before Income Taxes/Total Assets

X_4 – Market Value of Equity/Book Value of Debt

X_5 – Sales/Total Assets

Z – Total Z-Score

To assess any firm's possibility of bankruptcy, their Z-Score is compared with the predetermined cutoffs which are shown below:

If $Z < 1.81$ Distress Zone

If $1.81 \leq Z < 2.99$ Zone of ignorance

If $Z > 2.99$ Safe Zone

Because the initial Z-Score model was based on the market value of the enterprises, it was not suitable for every situation. To address this problem, Altman (1983), re-estimated the original model, substituting the book value of equity for the market value in X_4 . The revised Z'-Score had the following form:

$$Z' = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5,$$

Where

X_1 – Working Capital/Total Assets

X_2 – Retained Earnings/Total Assets

X_3 – Earnings before Income Taxes/Total Assets

X_4 – Book Value of Equity/Book Value of Debt

X_5 – Sales/Total Assets

Z' – Total Z'-Score

The revised predetermined cutoffs for the Z'-Score are as follow:

If $Z < 1.23$ Distress Zone

If $1.23 \leq Z < 2.90$ Zone of ignorance

If $Z > 2.90$ Safe Zone

Although Altman's Z-score developed in 1968 using a small sample of firms, it is considered to be the most authoritative method for predicting a possible bankruptcy, assuming that it has 75-90% reliability in its forecast (Ko, Fujita, & Li, 2017). It is still used in a variety of business situations, which include not only the prediction of bankruptcy but also management decision making (Grice & Ingram, 2001).

However, the Z-Score has been questioned about discrimination, underpinning theory, generalizability and the relative importance of variables (Ko, Fujita, & Li, 2007). Furthermore, Grice and Ingram (2001) in their survey, questioned the current uses of Altman's model. They indicate that the model's precision is significantly lower in recent periods than that reported in Altman's study in 1968. Specifically, although Altman reported 83.5% accuracy for his model using a sample from 1958 to 1961, Grice and Ingram (2001), reported that the overall accuracy for their 1988-1991 sample was 57.8%. They also extended their analysis, proposing that by re-estimating the model coefficients, the accuracy of results could be better.

In conclusion, although Altman's model is considered reliable and is used widely for predicting businesses' bankruptcy, some recent studies have questioned the accuracy of its results. In any case, when estimating financial distress, the Z-score results should be interpreted with caution.

Methodology

In our study, we attempted to test the credit risk in the Greek energy sector using the Altman Z-Score model. For this purpose, we examined the top-4 companies that operate in this sector. We selected these companies as they hold the largest market shares in the energy industry. The sample number is judged to be satisfactory, considering the limited number of energy companies that operate in the Greek energy market.

Table I: Market Shares of the top-4 companies

No	Companies	Market Shares (2016)
1.	Public Power Corporation (PPC)	89.90%
2.	PROTERGIA	2.69%
3.	ELPEDISON	2.40%
4.	HERON Group	2.35%

We used financial data from the annual balance sheets and income statements of these companies from 2012 to 2015. These data were extracted from the official websites of the examined companies. For the companies of HERON Group and ELPEDISON unified balance sheets and income statements were developed to have comparative data. Specifically, the financial statements of the HERON Group, HERON I THERMOELECTRIC SA and HERON II THERMOELECTRIC STATION OF VIOTIA SA's were unified, while the financial statements of ELPEDISON Power and ELPEDISON Energy were used for ELPEDISON.

For the companies Public Power Corporation (PPC) and PROTERGIA, we implemented the initial Altman's Z-score, which introduced in 1968, as they are listed at the Athens Stock Exchange. To compute the market value, we took the market value on 31 December of each year, which were taken by the CAPITAL database. For the other two companies, HERON Group and ELPEDISON, we implemented the revised Altman's Z'-Score, as they are not listed at any Stock Market.

Results

Examining the Z-score of the four companies which operate in the energy sector, we found out that all companies face the risk of economic downturn, as they record low Z-scores within the given period. More specifically, the Z-scores of the PPC, PROTERGIA, and ELPEDISON showed that these companies stayed in the Distress Zone for all the years 2012-2015. Furthermore, PROTERGIA displayed the lowest results, showing even a negative rate in 2015. The HRON Group was in a better position as it was the only company that for the year 2014, displayed a rate which would classify it in the Zone of Ignorance. Nevertheless, for the other three years, the company was in the Distress Zone.

Table II: Results of Altman Z-Score

No	Companies	Z Score			
		2012	2013	2014	2015
1	Public Power Corporation (PPC)	0,55	0,56	0,61	0,49
2	PROTERGIA	0,01	0,27	0,25	- 0,12
3	HRON Group	0,99	1,21	1,40	0,73
4	ELPEDISON	0,75	1,00	0,47	0,13
		Z <1.81 (Distress Zone) 1.81≤Z <2.99 (Zone of ignorance)		Z >2.99 (Safe Zone)	
		Z<1.23 (Distress Zone) 1.23<Z<2.90 (Zone of Ignorance)		Z>2.90(Safe Zone)	

Analytically, all examined companies faced immense liquidity problems, as they displayed negative or low rates in variable X1 (Working Capital/Total Assets). This factor contributed (negatively) to most final Z' Scores. On the other hand, the variable which positively contributed to most final Z' Scores, was the variable X5 (Sales/Total Assets), which illustrates the sales-generating the ability of the firms' assets. In spite of this, it could be said that the asset utilization by the companies was low, as it was shown by the rates of variable X5. In other words, this means that they did not intensely use their assets to carry out their sales.

Furthermore, as it was shown by the variable X2 (Retained Earnings/Total Assets), these firms showed high leverage, as their Retained Earnings were low, relative to their Total Assets. This means that they have financed

their assets utilizing debt, then through the retention of profits. Also, from the values of variable X_3 (Earnings before Income Taxes/Total Assets), it could be inferred that the true productivity of companies was low, as their earning power of its assets was limited.

Table III: Variables of Altman Z-Score

VARIABLES OF Z-SCORES						
PPC	X_1	X_2	X_3	X_4	X_5	Z-SCORE
2012	-0,06	0,09	0,07	0,08	0,37	0,55
2013	0,09	0,08	0,05	0,14	0,38	0,56
2014	0,05	0,08	0,07	0,07	0,34	0,61
2015	0,01	0,08	0,02	0,05	0,33	0,49
Z<1.81: Distress Zone 1.81<Z<2.99: Zone of ignorance Z>2.99: Safe zone						
PROTERGIA	X_1	X_2	X_3	X_4	X_5	Z-SCORE
2012	-0,37	-0,01	0,04	0,02	0,32	0,01
2013	-0,31	0,02	0,16	0,04	0,36	0,27
2014	-0,15	0,03	0,16	0,03	0,17	0,25
2015	-0,28	0,02	-0,04	0,02	0,19	-0,12
Z<1.81: Distress Zone 1.81<Z<2.99: Zone of ignorance Z>2.99: Safe zone						
ELPEDISON	X_1	X_2	X_3	X_4	X_5	Z-SCORE
2012	-0,26	0,00	0,14	0,12	0,75	0,75
2013	0,06	-0,00	0,15	0,14	0,65	1,00
2014	-0,28	-0,00	0,15	0,17	0,44	0,47
2015	-0,29	-0,05	-0,05	0,13	0,40	0,13
Z<1.23: Distress Zone 1.23<Z<2.90: Zone of ignorance Z>2.90: Safe zone						
HRON Group	X_1	X_2	X_3	X_4	X_5	Z-SCORE
2012	0,06	0,06	0,16	0,24	0,47	0,99
2013	-0,09	0,09	0,24	0,32	0,66	1,21
2014	0,11	0,11	0,23	0,38	0,57	1,40
2015	0,04	0,05	-0,26	0,28	0,61	0,73
Z<1.23: Distress Zone 1.23<Z<2.90: Zone of ignorance Z>2.90: Safe zone						

Examining the variable X_4 (Market Value of Equity/Book Value of Debt) for the PPC, we found out that its market value has diminished, as its stock price dropped down from 5.89 in 2012 to 3.88 in 2015. This means that its assets declined in value, reducing its solvency. Likewise, although the market value of PROTERGIA did not show broad fluctuations, its stock price declined in 2015, limiting its solvency.

Table IV: Stock Prices for PPC and PROTERGIA for the years 2012-2015

Date	Stock price for PPC	Stock price for PROTERGIA
31/12/2012	5,89	4,38
31/12/2013	10,80	5,56
31/12/2014	5,40	4,55
31/12/2015	3,88	3,67

Regarding the HRON Group and ELPEDISON's variable X_4 (Book Value of Equity/Book Value of Debt), it could be said that the HRON Group had the bigger economic autonomy, as it displayed the higher rates. This means that this firm was economically independent in a greater degree than the other companies, as the return of foreign capital to their beneficiaries was safer.

Finally, the results of the Altman model indicated that all examined companies face the risk of economic distress, as they recorded low Z Scores for the period 2012 to 2015. It is worth noticing that the only company which for the year 2014 remained in the Zone of Ignorance was the HERON Group, making the risk of bankruptcy for this year difficult to assess. Generally, the economic situation of the companies is characterized by a lack of liquidity, low productivity, and high leverage. Operating in these conditions they become vulnerable in a period that the Greek energy sector requires reform.

Discussion

Regarding the EU target of increasing competition and through it decreasing prices in consumption and production, to ensure energy provision, to avoid oligopoly and perhaps to decrease inequality, we are only moderately optimistic about the accomplishments by now and future hopes. Between 2005 and 2015 when EU orders were fully activated, energy prices for the consumer sector increased in Greece around 150% and in the EU around 50%. In Greek manufacturing, energy prices increased around 44% and in the EU around 20%-25%. On first sight, these huge price increases may be considered a complete failure at the EU level and especially for Greece. But there are some second thoughts. First, a certain significant part of the increased prices comes through increased energy taxes which as such cannot be a reform deficiency. In Greece, there was a tremendous increase in the indirect tax coefficient (around 250% (!)) in the same period, which can easily explain (and certainly outperforms) real price increases. The EU tax increases for the same period were moderate (around 15%) which is less than the actual price increases. Then we have a possible paradox since the well reformed EU energy sector seems at a first glance to provide price increases not easily explained through tax increases (but perhaps explained through increases from renewables or /and otherwise unjustified ones). From the other hand, the poorly reformed Greek energy sector seems to fully justify its price increases through tax and renewable resources increases. This is an expected finding. Nevertheless, for whatever reason, justifiable or not, real price decreases which are the expected and desired outcome of the energy market reforms, are nowhere observed in the European horizon yet...

A second expected outcome of the energy sector reforms is energy provision stability and oligopoly avoidance. The present paper provides some preliminary findings on the above issues. Based in Z or Altman test scores, a well-known and generally accepted measure of the financial distress status of companies, the results show that the leading company (PPC), as well as its' main followers and potential competitors as energy providers, are heavily distressed financially and in a danger zone. These are not good news. To begin with, a sector with almost all of its enterprises in financial distress and possible bankruptcy danger has oligopoly potential or danger of price increases. This is so because one possibility is some (or one) of the existing company energy providers (not PPC, due to EU rules) will outperform other laggards and drag them out of the market, exploiting scale economies or other suitable methods as, for example, increased advertisement expenditures etc. (Landes and Posner,1981). Another danger lies in market upheavals because of possible bankruptcies and market "holes" which can be the outcome of the above process of market exits and /or bankruptcies.

Concluding Remarks

Our results point to a rather obscure and perhaps worrying future. The main electricity provider, the oligopolistic leader of the industry, PPC, is in dire straits and there is no easy escape of its financial problems, which are indicated by the extremely low intertemporal prices of the Z Altman test score. But the main picture does not differ qualitatively if we take under consideration its other main electricity provider rivals. They are also financially distressed, and they participate in a constant state of flux, in an unstable industry, with many entries, bad outcomes and uncertain future. After all this turmoil there is a clear danger of oligopoly with its negative outcomes (agreed-upon prices etc.) since the exploitation of economies of scale entails such a danger. In this case, there will be an urgent need for the energy regulation authority to be extremely capable, to curb possible oligopolistic tendencies.



All the above thoughts indicate that the Greek authorities must reconsider the situation and possible outcomes of the energy sector, to obtain more sustainable and consumer-friendly results.

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