CONSIDERATIONS REGARDING THE CORRELATION OF CERTAIN ENERGETIC COMPETITIVENESS INDICATORS

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Abstract - This paper targets the identification of certain correlations between some energetic security indicators and some energetic performance indicators. The first part of the article refers to the importance of the concernes regarding the competitiveness of the energetic processes. The second part of the article presents the working methodology, also in this section we tryed defining two correlation coefficients and to present the econometric model and assessement algorithm. The third section of this article presents the results and the last section of the paper presents the main conclusions of the analysis.

Keywords: competitiveness, indicators, energetic security, energetic performance

1.INTRODUCTION

Economic competitiveness in the context of sustainable development is strongly influenced by the energetic intensity. Energy is an important vector of the modern civilisation. The way we use the energetic resources directly influences the targets established by most of the sustainable development strategies. Out of the recent estimations we can notice a recent increase with over 30% of the energy consumption by the year 2030, compared to 2010 [1], the main share of the primary energetic resources (REP) maintaining in the cathegory of scarce energetic resources (REE), all though the renewable energy resources (RER). is increasing cu toate că ponderea resurselor regenerabile de energie (RER) este în creştere. EU established the Treaty regarding the Energy Charta (T-CEN) and the Energy Charta Protocol (P-CEN). T-CEN's general objective is establishing a legal framework for promoting long term cooperation in the energy sector. P-CEN's main objectives are [2]:

- Promoting the energetic efficiency policies compatible with sustainable development conditions;
- Establishing the main conditions to stimulate producers and consumers to use energy more economical. ecological and more efficiently possible;

- Encouraging cooperation in the energetic efficiency sector.

For the EU energetic policy, the targets established by EU Sustainable Development Strategy (SDDUE), respectively the 20-20-20 directions are very important [3].
With the help of the Energy Green Charta (CV-EN) "A European strategy for safe, competitive and sustainable energy"[4] the European Commission invites the member states to make all efforts to include three important targets into the energetic policy:

- **Durability** – for preventing the climate changes through promoting RER and icreasing the energetic efficiency
- **Competitiveness** – through improving the European energy transportation and distribution networks
- **Supplying security** – through coordinating measures regarding the energy supply and demand inside the EU, in international context.

An important document that refers to the EU's strategy in the energetic sector is the balance document of the European Commission entitled "To a new energetic strategy for Europe 2011 - 2020 (D-NSE)". D-NSE published on 7th of May 2010, [5] is considered to be the first step to a unitary and comprising energy policy at EU level and this is done according to Strategy EUROPA 2020 (SE2020). Along with D-NSE ratification, the European Parliament requested the formation of European Energetic Community, stipulating that the New Energetic Strategy (NSE) should be implemented in the spirit of solidarity and responsibility, starting from the principle according to which not a single member state should be left behind or isolated.
Romania always had and still has, although formally, an Energetic Strategy (SER). The problem is the continuous modification of SER, often made from less objective considerations. In 2003, Romania published "The energy roadmap" with the purpose of joining the EU. In 2007 SER was published for the period [2007-2020] that presents the action directions in the energetic field, established according to EU member state conditions.

SER's strategic objective is represented by "satisfying the energy necessities on short and long term, at the lowest price possible, suitable for the modern market economy and the living standards in conditions of quality, safe supply and respecting the sustainable development principles [6].

In [7, 8] we considered and defined the set of indicators used for presenting the energetic competitiveness, structured and based on the strategies and applied policies. The 46 indicators chosen for assessing the energetic competitiveness were structures [7, 8] on 5 pillars representing: the energetic security, energetic efficiency, RER capitalization degree, environment impact and institutional capacity.

In [7] we present the assessment results for 9 of the proposed indicators and their recent evolution in Romania, EU and four other member states considered to be the reference points of the analysis.

This article continues the previous research, following the correlation between three of the indicators for energetic competitiveness, structured inside the pillars: energetic security, energetic efficiency and RER capitalization degree.

2. WORKING METHODOLOGY

The indicators we make reference to in this article are the following:

- Energetic independence (pillar 1 – energetic security);
- Primary energetic intensity (pillar 2 – energetic efficiency);
- RER share of the gross final energy consumption (pillar 4- RER capitalization degree)

We will use Eurostat data base [9] and the values of the three indicators for Romania and the following reference member states: Germany, France, Hungary and Bulgaria. The explanation for choosing the previous mentioned member states is based on the following considerations:

- Germany – is EU reference member state for the economic pillar and the social pillar of Sustainable Development (DD);
- France – is EU's reference state for the environment pillar and the social pillar of DD
- Hungary – is the Western neighbour of Romania, that joined the EU in 2004, 3 years before Romania. Therefor is usefull to identify the „competitiveness engine"and to apply it in Romania;
- Bulgaria – is the country that joined EU in 2007, the Sothrn neighbor of

Romania, and the country that Romania is ofen compared to.

The above mentioned indicators are published by Eurostat data base in the following measurement units:

- Energetic independence (IEN) in [%] of the total energy consumption;
- Primary energetic intensity (IEP) in [kgeo/1000€];
- Share of RER in the gross final energy consumption (PRR) [%] of the final gross energy consumption.

The energetic independence level is medium and long term influenced by the natural endowment of the analysed country, with energetic resources as well as the development degree and the implementation of technology used to capitalize the energetic resources.

Normally, on short term, energetic independence should rise along with the decrease of energetic intensity and the rising of capitalization degree of renewable energetic resources. In this article we will study the above mentioned indicators for the period [2006-2012], for the five member states, calculating the correlation coefficients:

- Energetic independence – primary energetic intensity:
$$c_i = ien(t)/iep(t); \quad t \neq t_0 \quad (1)$$
- Energetic independence – RER share of the gross final energy consumption:
$$c_r = ien(t)/prr(t); \quad t \neq t_0 \quad (2)$$

where:

$$ien = \frac{IEN(t) - IEN(t_0)}{IEN(t_0)} \, 100 \, [\%] \qquad (3)$$

$$iep = \frac{IEP(t_0) - IEP(t)}{IEP(t_0)} \, 100 \, [\%] \qquad (4)$$

$$prr = \frac{PRR(t) - PRR(t_0)}{PRR(t_0)} \, 100 \, [\%] \qquad (5)$$

t_0 – reference year (2006);
t – current year [2007÷2012].
We will consider:

- „strong correlation" if $(c_i \wedge c_r) \in [0,75; 1,25]$;
- „medium correlation" if $(c_i \wedge c_r) \in [0,5; 0,75) \cup (1,25; 1,5]$;
- „lack of correlation" if: $0,5 > (c_i \wedge c_r) > 1,5$.

3.RESULTS

In Table 1 we will present the energetic independence values [%].

Table 1 Venergetic independence values[%]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	39,3	41,9	39,5	38,5	40,2	38,5	38,9
France	48,5	49,6	49	49	50,7	51,3	51,9
Romania	70,8	68,5	72,3	79,8	78,3	78,4	77,3
Hungary	37,3	38,7	36,6	41,3	41,7	48,2	47,7
Bulgaria	53,8	48,7	47,9	54,7	51,2	64	63,9

Source: Author's calculation unsing the information available on Eurostat web site, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

În Table 2 we will present the energetic intensity values.

Table 2 Energetic intensity values [kgeo/1000€]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	149,2	141,3	140,3	138,9	140,5	129,2	129,2
France	153,1	148,2	150,9	148,9	150,7	142,6	142,9
Romana	409,9	437,7	407,1	387,4	394	393,4	378,8
Hungay	294,4	288,5	285,9	285,7	294,1	281,6	268,7
Bulgara	823	760,8	711,7	661,4	668,8	705,5	670

Source: Author's calculation unsing the information available on Eurostat web site,, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

În Table 3 we will present RER share of the final energy consumprtion.

Tabele 3 RER share of the final energy consumprtion [%]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	7,7	9	8,5	9,9	10,7	11,6	12,4
France	9,5	10,2	11,2	12,2	12,7	11,3	13,4
Romania	17,1	18,3	20,4	22,6	23,2	21,2	22,9
Hungary	5,1	5,9	6,5	8	8,6	9,1	9,6
Bulgaria	9,7	9,4	10,7	12,4	14,4	14,6	16,3
EU28	9,3	10	10,5	11,9	12,5	12,9	14,1

Source: Author's calculation unsing the information available on Eurostat web site,, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themesL

Using 2006 as reference we will calculate the relative values of the indicators (ien, iep, prr), that we will therefor present in Tables 4÷6.

Table 4 Values of indicator ien [%]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	0	6,61	0,5	-2,04	2,29	-2,04	-1,02
France	0	2,26	1,03	1,03	4,53	5,77	7,01
Romania	0	-3,25	2,11	12,71	10,59	10,73	9,18
Hungary	0	3,75	-1,88	10,72	11,79	29,22	27,88
Bulgaria	0	-9,48	-10,97	1,67	-4,84	18,95	18,77

Source: Author's calculation unsing the information available on Eurostat web site,, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

Table 5 Values of indicator iep [%]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	0	5,3	5,97	6,91	5,83	13,41	13,41
France	0	3,21	1,43	2,75	1,56	6,85	6,66
Romania	0	-6,78	0,68	5,48	3,73	3,95	7,58
Hungary	0	2,01	2,89	1,59	0,1	4,34	8,72
Bulgaria	0	7,56	13,52	19,63	18,73	14,27	18,59

Source: Author's calculation unsing the information available on Eurostat web site,, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

Table 6 Values of indicator prr [%]

Year MS	2006	2007	2008	2009	2010	2011	2012
Germany	0	16,88	10,38	28,57	38,96	50,64	61,03
France	0	7,36	17,89	28,42	33,68	18,94	41,05
Romania	0	7,01	19,29	32,16	35,67	23,97	33,91
Hungary	0	7,27	27,45	56,86	68,62	78,43	88,23
Bulgaria	0	-3,1	10,3	27,83	48,45	50,51	68,04

Source: Author's calculation using the information available on Eurostat web site, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

Based on the values obtained for ien, iep and prr indicators we have calculated the values for the correlation coeficients (ci and cr), during the analysed period of time, for Romania and the other four member states. The values evolution is represented in the following two graphics.
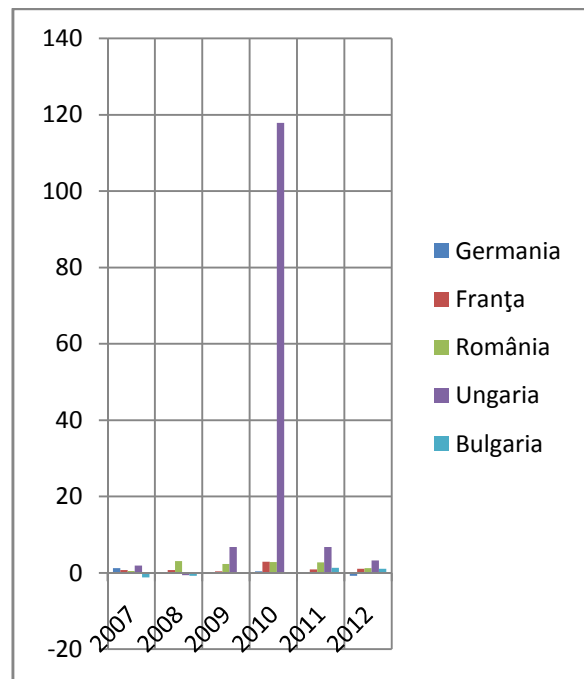

Fig 1 Correlation coefficient ci evolution [u.r]
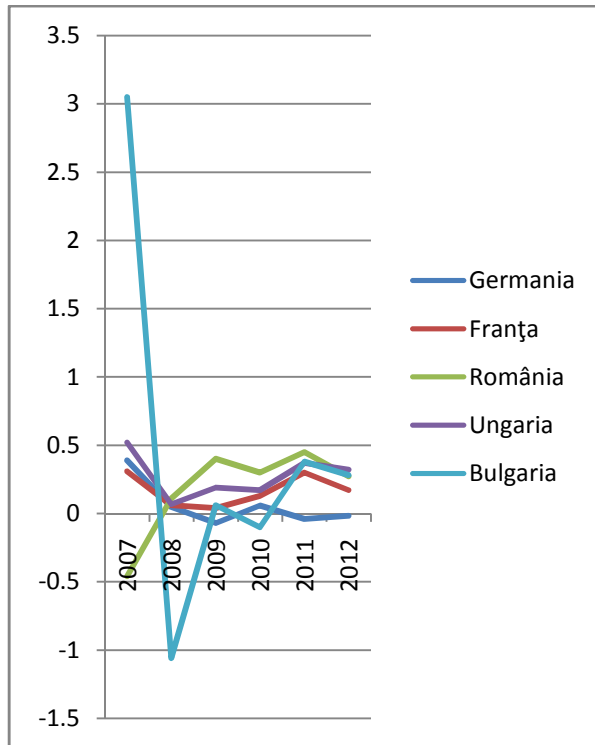Source: Author's calculation

Fig 2 Cr corelation coefficient evolution [u.r]
Source: Author's calculation

The correlation coefficient „energetic independence – energetic intensity" (ci) registred an osscillating vatiation, for all of the five analysed mamber states, reaching even negative values due to the increase of energetic dependence in the last period of time, compared to the year of reference 2006, respectively in 2009, 2011 and 2012 (Germany), (2008) Hungary and 2007, 2008 and 2010 (Bulgaria).

We can notice an extreme value of(ci) coefficient for Hungary in 2010. We can also notice a decreasing value for (ci) coefficient, that is specific to strong correlation, as follows: Germany (2007), France (2011, 2012), Romania (2012), Bulgaria (2012).

The correlation coefficient „energetic independence – RER share of final gross energy consumption (cr) registred an osscillating evolution for all five member states, even registering negative values for Germany (2009, 2011, 2012), Romaniei (2007), Hungary (2008) and Bulgaria (2008, 2010), due to the increase of energetic dependence.

We can notice only a single value that fits in the specific în intervalul caracteristic medium correlation, that beeing Hungary in the 2007.

CONCLUSIONS

For analysing the impact of the performance factors of the energetic industry on the energetic security, in this article we propose and defined and also assessed the two correlation coefficients mentioned in the first section of this article – „independence – energetic intensity" and „energetic intensity – RER share of final energy consumption".

The assessments we made, reflect only a small number of strong correlations, 5 respectively – in the case of (ci) indicator, only two cases of medium correlations in the case of (ci) indicator and only one in the case of (cr) indicator for Hungary in 2007.

Over the analysed period of time we can notice a relatively strong increase of the RER capitalization degree compared to the increasing degree of energetic independence degree in the case of all five analysed member states and a moderate increase of energetic independence for four of the selected member states (France, Romania, Hugary and Bulgaria).

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