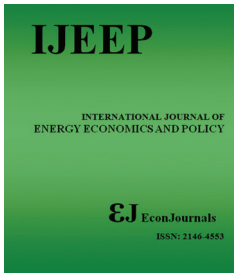

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Performance of the Electrical Energy Index in the Light of Institutional Changes in the Brazilian Electricity Sector

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ABSTRACT

This study aims to analyze the performance of the electrical energy index (IEE) in the perspective of Institutional Changes in Brazilian Electricity Sector. The research focused its efforts in analyze the impact of Provisional Measure No. 579 of September 11, 2012 (converted into Law No. 12783/2013) on the stocks of the Electric Power Sector, represented here by the respective sector index in BMF and BOVESPA. The research results reveal that from the release of Provisional Measure No. 579 by the end of the observed time interval (April 2015), the IEE didn't recovered from the reversal trend caused by this measure, which once was a growth trend but instantly became a stagnation/decay trend.

Keywords: Brazilian Electricity Sector, Capital Markets, Electrical Energy Index, Laws and Regulations, Provisional Measure No. 579/2012
JEL Classifications: G38, K23, L51, Q40, Q48

1. INTRODUCTION

Sectors of the economy that have a great impact on society tend to present strong state interference both directly and indirectly. The electrical energy sector would not be left out of this list of sectors where the state has strong interference in decision making and trading. This interference is justified since the electrical energy is considered as a basic service (public utility) and its performance interferes directly in the life of the Brazilians in general.

Government action in the Brazilian economy is essential for the country's development, but it is possible to affirm that it takes place in a cyclical way, as sometimes the state acts more actively, investing heavily in infrastructure, roads, hydroelectric power plants, creating companies and developing economy sectors, but at other times, especially in times of fiscal crisis, delegates such activities to private initiative (Filardi et al., 2014).

In this institutional context (in which the electric energy sector is settled), taking into account the last years, an event that caused a huge impact in the electric energy sector was the publication of Provisional Measure No. 579, of September 11, 2012 (BRASIL, 2012; BRASIL, 2013). This government action had an immediate impact on the market, causing a sharp drop in shares of energy sector companies. From this point of view, this study aims to analyze the performance of the electrical energy index (IEE) in the perspective of Institutional Changes in Brazilian Electricity Sector.

2. THEORETICAL BACKGROUND

2.1. Institutional Environment and Regulation of the Electrical Energy Sector

To understand the structure of the institutional environment settled in the electric sector, it is necessary to approach some important concepts, such as the concept of regulation and in what extent regulatory risks interferes in decision making and trading in each sector of the Brazilian economy.

The concept of regulation is presented in several different readings by various authors. These concepts present some similarities and also some differences. Taffarel (2015) brings a broad and direct concept of regulation, based on the idea of several authors. The author says that we can understand the regulation as a kind of field of action or intervention of the State, directly or indirectly,

on the economic agents, aiming to reach the equilibrium of a given system.

According to Dodge (2003), regulation is necessary to protect industries and consumers from potential negative effects in an economic environment where there is no competition. The possible effects that a non-competitive scenario can bring forth are: Artificially inflated prices for consumers or low prices for producers, illegal monopolization of an industry or even the formation of cartels. In a perspective more closely related to the electrical energy sector, regulation is also necessary when market failures or characteristics of a given sector creates a natural monopoly.

Durana (2006) tries to attribute common characteristics of sectors of the economy that are considered to be of public utility and where the natural monopoly often prevails. Below are the main similarities between these sectors according to the author:

- Utilities generally have interconnected (networked) structures that requires the use of public goods and rights;
- These industries create/generate a product or service in one place, and then distribute it over the entire network where it is delivered to numerous end users;
- The activities of these sectors can be divided into three segments: Production, transmission and distribution. In some cases these segments are vertically integrated;
- They usually present high costs in relation to the need to develop/build an extensive physical structure (high costs related to infrastructure);
- These sectors have significant gains in economies of scale, the average cost of production of a given good decreases drastically as the quantity produced increases.

In this scenario, it is responsibility of the regulatory institutions do not to allow market failures such as abuse of conditions and prices by the companies involved. The main justification for the regulation of public utilities was the existence of market failures, mainly the possibility of market power abuse by the monopolists. Regulation by the state was meant to correct these distortions by simulating competitive conditions. The protection of the public interest provided, then, the rationale for government intervention in the market place so as to minimize the economic inefficiencies that would result if the markets were left "free" (Durana, 2006. p. 30).

State through the regulation process intends to reach a balance between the interests of society and the interests of the companies involved, thus making the decisions taken are satisfactory for both parties (Taffarel et al., 2015).

2.2. Provisional Measure No. 579/2012

The Provisional Measure No. 579/2012 was published On September 11, 2012, which according to the Federal Government had the objective of reducing the price of the electrical energy tariff in Brazil. This reduction in the price of electrical energy tariff promised by the government was around 20.2%.

The Regulatory Agency of the Electricity Sector in Brazil (ANEEL) justifies the foundation of this law as essential for new investments related to the quality and continuity of services. ANEEL says that the main objective of this change of legislation is "To provide security and conditions for agents to make the necessary investments to maintain and continue to provide the service they hold. Minimize unnecessary interventions" (ANEEL, 2014).

On the other hand, Castro and Brandão (2013) understand that the real motivations on the part of the government for the publication of Provisional Measure No. 579/2012 (converted into Law 12,783/2013) were:

- High tariff prices practiced in the regulated market;
- End of the power plants contracts, representing approximately 40% of the hydroelectric energy in Brazilian Market (34% in 2015 and 6% in 2017) and transmission lines equivalent to 66% of the national total;
- Insecurity related to the effectiveness of a bidding in an oligopolistic sector;
- End of the old energy contracts as of December 31, 2012.

It was understood that the best decision for energy policy would be to extend the contracts of energy companies. In order to extend these contracts, the government would set new terms for new 30-year contracts (Castro and Brandão, 2013).

Costellini and Hollanda (2014) point out that these measures proposed and implemented through provisional measure No. 579/2012 can be considered as a watershed (before and after MP 579) in the Brazilian electricity sector. Many of the impacts we see today in the industry came from this governmental interference.

As a result of this change of legislation where the electricity energy contracts were renewed, it was up to the energy companies to adapt to the new requirements and rules imposed by the Federal Government, requirements and new rules that caused a huge financial impact on the companies.

3. METHOD AND DATA

The most relevant data collected to build and ground the analysis that this article proposes to make are the historical quotations of the IEE. Therefore, the time horizon of the IEE quotations adopted in the survey was from April 2009 to April 2015.

Historical quotations of other sectors indexes will also be used in order to compare their respective performances with the performance of the IEE. These indexes will be the Consumption Index (ICON), Financial Index (IFNC) and Industrial Index (INDX).

In addition, indicators usually used in the capital markets such as relative price, daily, weekly or monthly return, and volatility will support the evaluation of the performance of the IEE.

4. ANALYSIS AND RESULTS

This chapter presents how was the situation of the electric sector in BMF and BOVESPA (including growth expectations, variation

in the period, future projections) before the Provisional Measure No. 579/2012, and compare with the situation of the sector after the release of Provisional Measure No. 579/2012 (BRASIL, 2012; BRASIL, 2013), evaluating the same indicators growth expectation, variation in the period, future projections, among others.

4.1. The IEE and the Provisional Measure No. 579/2012

As soon as the Provisional Measure No. 579 was announced and with the instantaneous support of the Eletrobras group (whose largest shareholder is the Federal Government), there was an immediate impact on the price of Eletrobras stocks in the Brazilian capital market and consequently a large impact on the IEE. In order to analyze this impact and other factors, it follows Graph 1 with the quotation of the IEE from April 2009 to April 2015.

Analyzing Graph 1, it was noticed that during this 6-year period (April/2009–April/2015), the IEE showed a positive oscillation of 67.65%, rising from 17,200 points on April 01, 2009 and reaching 28,836 points on April 15, 2015 (the last day considered for analysis in the survey).

It is important to note that in certain moments prior to Provisional Measure No. 579/2012, the IEE price reached a positive variation >100% in relation to the period of the beginning of the survey (April 1st, 2009), surpassing 35,000 points in the first half of 2012, as can be seen in Graph 1.

It is possible to observe a sharp drop in the electric energy index since September 2012, totally changing the expectation and projection of growth of the IEE from this point forward. Clearly, the direct influence that the Provisional Measure No. 579/2012 had on the IEE was observed instantaneously, from the point previously mentioned (September 2012 onwards).

Examining Graph 1, it is possible to notice that from this point of September 2012 until the final period considered, April 2015, the IEE did not recover from the trend reversal provoked by MP 579, which before the measure was a growth trend and after the measure became a trend of stagnation/decline.

Graph 2 shows the situation of the electric energy index prior to the publication of Provisional Measure No. 579/2012.

In Graph 2, during this period of more than 3 years taking into account as previous to MP 579, April/2009–July/2012, the electric energy index showed a positive variation of 97.92%, rising from 17,200 points in April 1, 2009 and reaching 34,008 points on July 16, 2012 (last day taken into account as prior to MP 579 for Graphical analysis purposes only).

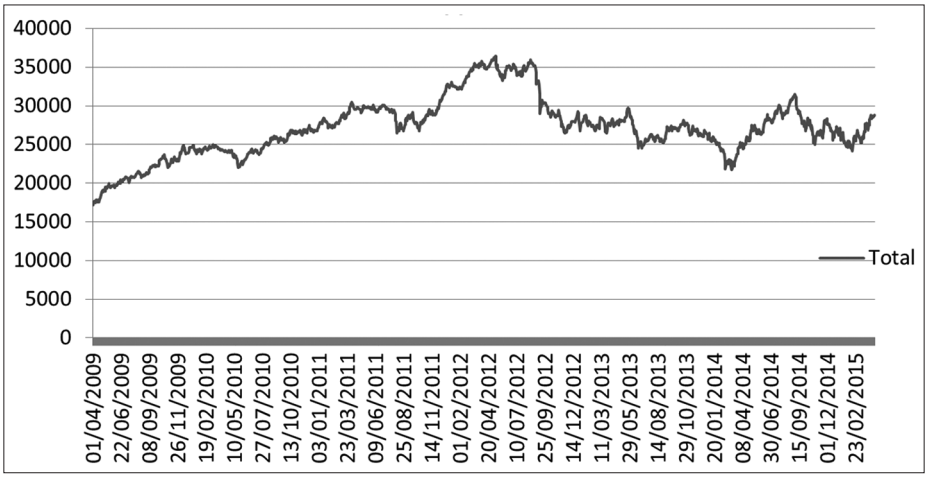
It is possible to notice the constant growth of the IEE from 2009 until the middle of July/August 2012. In the total period of time researched (April/2009–April/2015) the IEE reached a maximum price of 36,391 points, on May 11, 2012. This price of 36,391 points represents a positive change of 111.58% in relation to the beginning of the period observed (17,200 points on April 1, 2009).

Due to the arguments and data that were exposed in the previous paragraphs, it is clear the growth trend in the electric energy index in the period from 2009 to the first half of 2012. This growth trend ended with Provisional Measure No. 579/2012, as can be seen in Graph 3.

Graph 3 shows that during this period of <3 years taking into account as post-provisional measure 579, from July/2012 to April/2015, the electric energy index showed a negative oscillation of −15.21%, starting in 34,008 points on July 16, 2012 and reaching 28,836 points on April 15, 2015 (the period from July 16, 2012 to April 15, 2015, taken into account as the period subsequent to Provisional Measure No. 579/2012 is a period used only for Graphical analysis).

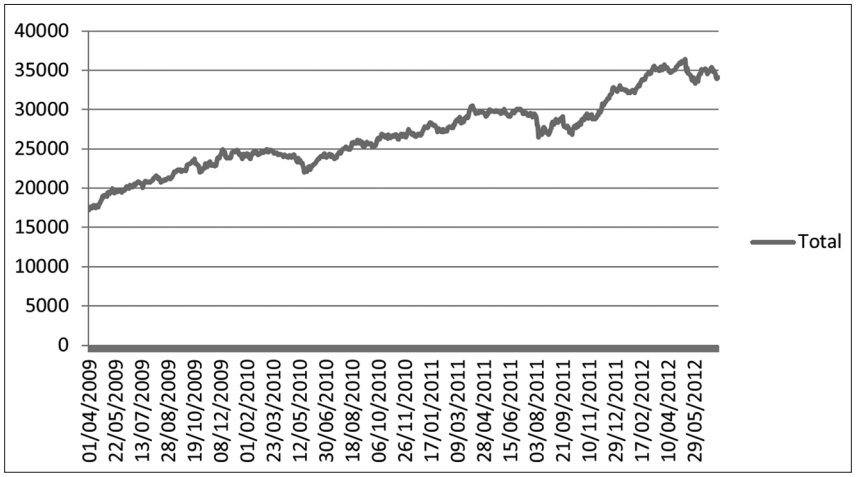
It is interesting to note the trend inversion in relation to Graph 2 (IEE - Quotation before MP 579), where it presented a clear growth outlook for the Electric Energy Index. On the other hand,

Graph 1: Quotation of the electrical energy index from April/2009 to April/2015



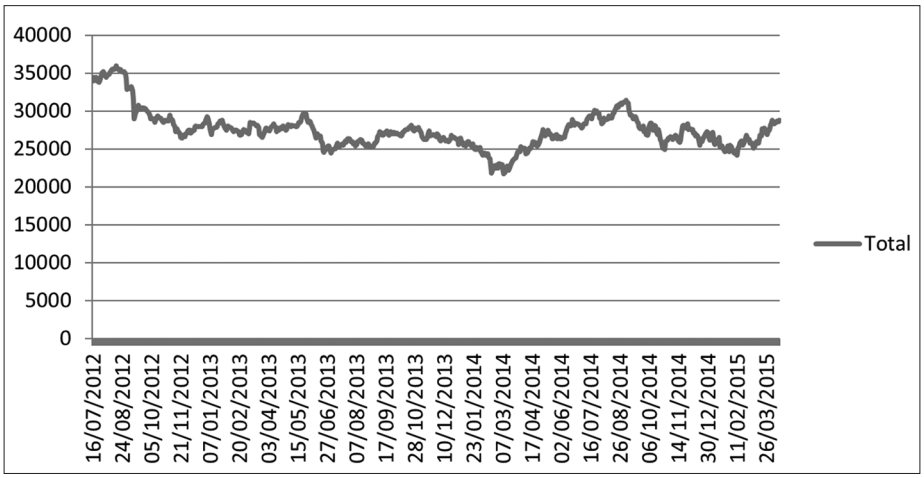
% Variation	67,65%
Nominal variation	11.636

Graph 2: Quotation of the electrical energy index before MP 579



% Variation	97,72%
Nominal Variation	16.808

Graph 3: Quotation of the electrical energy index (IEE) after MP 579



% Variation	–15,21%
Nominal Variation	–5.172

in Graph 3, it is possible to see clearly that there is no prospect of growth that could be equivalent to that of the first half of 2012, taking into account that after MP 579 the electric energy index was never able to reach the quotations of the mentioned period.

After provisional measure Nº 579/2012, the maximum quotation reached by the IEE was 31,478 points, on September 03, 2014. This maximum quotation after MP 579 represents a negative oscillation of -7.44% in relation to the beginning period of Graph 3 (July 16, 2012).

The minimum quotation after MP 579 was 21,750 points, reached on March 10, 2014. This minimum quotation after MP 579 represents a negative oscillation of −36.04% in relation to the same period of the beginning of the Graph, mentioned in the paragraph above. Taking into account the year of 2015 until the last date considered in the research (April 15, 2015), the Electric Energy Index ranges from 25,000 to 28,000 points.

4.2. IEE X Other Indexes

In this section of chapter 4, the fluctuation of other indexes for the same period considered for the IEE (April 2009–April 2015) will be discussed. In addition to the IEE, the other indexes taken into account in this analysis are:

- ICON – consumer goods index: It is the indicator of the stocks of the companies representing the sectors of cyclical and non-cyclical consumer goods (BMF and BOVESPA, 2015).
- INDX – industrial index: This index was developed to measure the performance of the most representative stocks of the industrial sector, an important segment of the Brazilian economy (BMF and BOVESPA, 2015).
- IFNC – Financial Index: This index is intended to be the indicator of the shares of companies representing the sectors of financial intermediaries, financial services, pension and insurance services (BMF and BOVESPA, 2015).

Graph 4 brings the fluctuation in the quotations of these four indexes (IEE, ICON, INDX, IFNC) during the observation period considered in this research, from April 1, 2009 to April 15, 2015.

All the indexes demonstrated positive oscillation in this 6-year time horizon, as referred to in Graph 4, but in different proportions.

The consumer goods index showed the highest increase in this period, having a similar appreciation in 2009, 2010 and 2011 and growing exponentially in 2012, 2013, 2014 and 2015, reaching a positive oscillation close to 300% in relation to the beginning of the period.

The financial index and the industrial index presented similar performances throughout the observed time. This can be seen from the similar highs and lows that the two indexes had together during most of the years, as shown in Graph 4. It is understood that there may be some kind of correlation between the IFNC and the INDX. At the end of the analyzed period, the financial index appreciated slightly more than 150% and the Industrial Sector Index slightly <150%.

The IEE showed similar performance in comparison to the other three indexes in the 1st years, but with some differences, as the IEE increased in a slightly lower level in the beginning of Graph 4. The IEE was in a growing trend of performance, where in 2011 and the first half of 2012 reached the level of appreciation of IFNC and INDX. However, this growing trend has completely reversed in the second half of 2012 (as can be seen in Graph 4.), as a consequence of the publication of provisional measure No. 579/2012. From this point on, the growth of the index lost "breath" and was no longer able to keep up with the appreciation levels of other indexes.

4.3. Risk, Return and Volatility of the IEE

In order to have a more in-depth analysis of the performance of the IEE, it is necessary to take into account some commonly used indicators in stock valuation in the capital markets. The indicators referred and which will be addressed in this section of the survey are: Risk, return and volatility.

The term risk is most often used erroneously only with a negative connotation, and is generally used as a sense of "risk of loss." However, in the financial market this is not exactly what the term "risk" means.

Jorion (1998) points out that although the term risk sometimes is used as "danger of loss," finance theory defines it as "dispersion of unexpected results due to fluctuations in financial variables." Thus, positive and negative fluctuations should be seen as sources of risk. Extraordinary actions, both good and bad, should be observed with caution.

It is interesting to highlight the relationship between risk and return in the capital markets in general. According to the concept of risk brought in the theory of finance, where risk is seen as uncertainty in relation to the results, in both positive and negative oscillations, it is possible to infer that higher risk stocks have a higher expectation of return.

Hull (2001) defines that the expected return by investors on a particular stock depends on some variables, among these variables the risk level of this stock stands out. The higher the risk, the greater the expectation of return required by investors.

Taking into account this uncertainty regarding the level of risk of an asset and the expectation of return in relation to it, a tool that is widely used in the capital markets to precisely measure this relationship between risk and return is volatility. According to Hull (2001), the volatility of a stock can be understood as the measurement of uncertainty in relation to the returns provided by this stock. Still according to Hull (2001), the volatility of a stock can be estimated through the historical data of this stock, for this it is considered a fixed interval of time (it can be daily, weekly or monthly).

Graph 4: Electrical energy index X other indexes

Label	IEE – BLUE	ICON – RED	INDX – GREEN	IFNC – ORANGE

Table 1: Monthly return and relative price of IEE

Date (first date of each month)	Quotes	Relative price	Monthly return
April/09	17200	-	-
May/09	19115	1.11134	0.10556
June/09	19794	1.03550	0.03489
July/09	20646	1.04302	0.04212
August/09	21222	1.02792	0.02754
September/09	21249	1.00128	0.00128
October/09	22234	1.04635	0.04531
November/09	22214	0.99908	−0.00092
December/09	23322	1.04989	0.04868
January/12	32559	1.09088	0.08699
February/12	32459	0.99694	−0.00307
March/12	34438	1.06096	0.05918
April/12	35767	1.03859	0.03786
May/12	35981	1.00597	0.00595
June/12	33701	0.93664	−0.06545
July/12	35337	1.04854	0.04740
August/12	34932	0.98856	−0.01151
Sum of returns before MP 579	-	-	0.70848
September/12	33093	0.94734	−0.05409
October/12	29957	0.90524	−0.09955
November/12	29455	0.98325	−0.01689
December/12	27521	0.93434	−0.06792
January/13	29278	1.06385	0.06189
February/13	28049	0.95801	−0.04290
March/13	27180	0.96902	−0.03147
April/13	27739	1.02058	0.02037
January/15	26473	0.95890	−0.04197
February/15	25475	0.96229	−0.03844
March/15	26284	1.03177	0.03127
April/15	28250	1.07480	0.07214
Sum of returns after MP 579	-	-	−0.21231
Sum of returns - Total	-	-	0.49617

Elaboration based on data from the electrical energy index (IEE). IEE: Electrical energy index

In order to estimate the volatility of the IEE in the period studied, two formulas will be used: The relative price formula and the daily return formula. Hull (2001) defines the relative price as being: Relative price formula:

$$\frac{Si}{Si-1}$$

In the above formula, Si represents the stock price at the end of the defined period (i = 0, 1,.. n).

The daily, weekly or monthly return is defined by the following formula: Daily, weekly or monthly return formula

$$Ui=\ln\left(\frac{Si}{Si-1}\right)$$

For the construction of Table 1, a monthly observation interval of the IEE was considered from April 2009 until April 2015. For this, the first quotation of each month was taken into account.

The analysis of the monthly return and relative price table of the IEE demonstrates the difference between the pre-MP579 returns and the post-measure returns. Prior to publication of Provisional Measure No. 579/2012 (considered from April 2009 to August 2012 in Table 1) there was a sum of positive returns of 0.70848. Following the edition of the measure (considered from September 2012 through April 2015 in Table 1) the trend reversed completely, coming out of a sum of the positive returns as mentioned above for a sum of negative returns of −0.21231.

The sum of the returns of the whole period (April 2009 to April 2015) shows a positive return of 0.46717. It is important to observe that this sum of the returns at the end of the observed period could be much higher if the IEE had continued with the growth trend that had been presenting until August 2012, but that came to an end a month later with the referred institutional change.

As previously analyzed, the sum of the returns from the IEE pre-MP579 is positive and post-MP579 is negative, meaning that provisional measure Nº 579/2012 influenced the return. Volatility, however, is lower than before, which on the one hand is a sign of lower risk but also that there is lower transaction volume, which stems from the fact that a higher degree of uncertainty leads to fewer transactions, due to the fact that the Brazilian electricity sector has become less attractive to investors.

5. CONCLUSION

Previously to Provisional Measure No. 579/2012, the IEE was showing a clear perspective of growth, reaching historical maximums only a few months before the publication of such measure. However, after the release of the MP 579, there was an instant reversal of trend. What was once a growth perspective quickly turned into a declining/stagnating trend. In this scenario until the year of 2015, the IEE was never able to reach the level of the prices of the period prior to such measure.

Given the content presented in this research, it is understood that government interventions, through the change of regulatory policies, have an intense impact on the sector targeted by this regulation and the companies that operate in it, since the regulatory risk causes insecurity to the investors.

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