

MODELLING THE VOLATILITY OF ELECTRICITY SPOT PRICE IN BRAZIL

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Overview

Market reforms had important consequences on the electricity sector worldwide. Among these we can mention: the impacts on the organization of the industry, on new forms of investment and transactions in the industry. In this sense, there is a need to develop an electricity spot market to meet some important functions: increase flexibility of transactions; allow adjustments between the contracted power and the energy generated and to be a reference to long-term contracts. Namely, a spot market is an important adjustment mechanism between demand and supply.

As regards to the Brazilian electricity sector, there is a spot market that in fact fulfills the functions mentioned above. The spot market tends to adjust the differences between the electricity contracted and the one that was generated/consumed on the basis of the settlement price of the differences (PLD), which can be interpreted as a proxy for the spot price. In recent years, it has been observed a significant increase in the number of free consumers, partly spurred by short-term price, which until 2005 was at relatively low levels. However, from 2005, due to higher economic growth and the consequent strengthening of the relationship between demand and supply, the Settlement Price of Difference (PLD) has suffered significant volatility and unpredictability, making the short-term electricity market environment characterized by a high degree of uncertainty. In fact, the price of energy in various systems tends to demonstrate high degree of volatility in both thermal systems and in hydrothermal systems, which is the case of Brazil

In this sense, one of the biggest concerns of the Brazilian electricity sector agents, particularly those who operate in the Free contracting environment (ACL), refers to the volatility, and the consequent unpredictability, of the spot price, from now on PLD. These characteristics represent a significant financial risk for agents that act in the electric sector. Understanding the volatility of spot price is essential to calculate the portfolio risk and return.

So, the main goal of this paper is to model the volatility of the electricity spot price in Brazil.

Methods

In order to achieve the goal of the paper, we used prices from 2003 until 2015. The Electricity spot price in Brazil is on a weekly-basis, for the four submarkets, which are South, Southeast, North and Northeast. We modeled the volatility using ARCH models. And then we did Granger causality to test the relationship between prices in different submarkets.

Results

We tested the unit root for the four submarkets and we didn't confirm the null hypothesis, that the PLD is stationary. That means that the PLD is a volatile and unpredictable variable. We modeled the PLD in the four submarkets using Garch (1,1) and found that prices in the week before have strong influence in the subsequent week. But, it must be said that the PLD is a very difficult to forecast.

Conclusions

We found that the PLD is a very volatile asset that is very difficult to predict, and this represents a significant risk for firms operating in the Brazilian market. The main cause of this volatility is related to the physical characteristics of the industry. Approximately, 90% of the energy generated in Brazil comes from hydro plants. The PLD is calculated in an ex-ante weekly basis through stochastic dynamic programming dual models that analyze the current flow and the flow rates in the short, medium and long term. Thus, the PLD is not determined by demand and supply, but the result of a computer model, that takes into consideration the present and future availability of water. And by failing to take into account the demand side, the PLD is inadequate and gives inconsistent signal to investments and long-term contracts.

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