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Forecasting European thermal coal spot prices

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ABSTRACT

This paper presents a one-year forecast of European thermal coal spot prices by means of time series analysis, using data from IHS McCloskey NW Europe Steam Coal marker (MCIS). The main purpose was to achieve a good fit for the data using a quick and feasible method and to establish the transformations that better suit this marker, together with an affordable way for its validation.

Time series models were selected because the data showed an autocorrelation systematic pattern and also because the number of variables that influence European coal prices is very large, so forecasting coal prices as a dependent variable makes necessary to previously forecast the explanatory variables.

A second-order Autoregressive process AR(2) was selected based on the autocorrelation and the partial autocorrelation function.

In order to determine if the results obtained are a good fit for the data, the possible drivers that move the European thermal coal spot prices were taken into account, establishing a hypothesis in which they were divided into four categories: (1) energy side drivers, that directly relates coal prices with other energy commodities like oil and natural gas; (2) demand side drivers, that relates coal prices both with the Western World economy and with emerging economies like China, in connection with the demand for electricity in these economies; (3) commodity currency drivers, that have an influence for holders of different commodity currencies in countries that export or import coal; and (4) supply side drivers, involving the production costs, transportation, etc.

Finally, in order to analyse the time series model performance a Generalized Regression Neural Network (GRNN) was used and its performance compared against the whole AR(2) process. Empirical results obtained confirmed that there is no statistically significant

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difference between both methods. The GRNN analysis also allowed pointing out the main drivers that move the European Thermal Coal Spot prices: crude oil, USD/CNY change and supply side drivers.

1. Introduction

"Does energy production have to be based on fossil fuels?" "Will coal continue to play an important role in the energy mix?" "How much do we need coal to provide security of supply in our electricity network?" These questions are essential for the future planning of coal production and consumption within the European Union.

According to the International Energy Agency (2015a) the share of electricity from fossil fuels has not varied much since 1985, after the major introduction of nuclear capacity. The electricity generation mix in the Organization for Economic Co-operation and Development (OECD) in 2014 remained dominated by fossil fuels (59%), mainly coal and gas, 32% and 24%, respectively.

Although Patzek and Croft (2010) forecasted the peak of coal production from existing coalfields as quite imminent, expecting a fall by 50% within the next 20 years, and Mohr and Evans (2009) forecasted something similar on an energy production basis (between 2011 and 2047), it is indubitable that coal will remain an important part of the world economy during many years.

In January 2014 the European Commission published the policy framework for climate and energy in the period from 2020 to 2030 (European Commission, 2014). Its main concern was the reduction of greenhouse emissions while considering at the same time the need for a competitive and secure energy supply within the EU.

This need for a secure energy supply has changed favourably the economic arguments for coal. Nevertheless, coal industry and coal-fired power generation within Europe are pushed by several factors, which are not independent of each other:

- Worldwide coal prices are low due to overproduction: without climate policy low coal prices would drive electricity production from natural gas to coal (Van Ruijven & van Vuuren, 2009), but this is not the scenario;
- A new variable is affecting the energy markets: the EU emission trading scheme, which started in 2005, setting caps for CO_2 emissions from power plants that can be increased only by the acquisition of emission allowances;
- Regulatory pressure to reduce greenhouse gas emissions due to new air pollution limits will come into force in 2016;
- If the damage costs that result from fossil fuels combustion are internalised into the electricity price, some renewable technologies may be financially competitive in comparison with electricity generation from coal (Owen, 2006); and,
- Coal production will lose state aids by 2018 in the European Union and money-losing mines will have to close after that.

The European Commission (2013), forecasted the changing in Europe's energy mix till the 2030 scenario with a 30% reduction in solid fuels and an 80% increase in renewables (Table 1).

During the next years there will be a stable increase of renewables share into the energy mix. Nevertheless, their dominance will take decades to come according to BRG (2014).

Europe's domestic coal production plus hard coal imports during the first semester of 2015 were 2.7% lower than the previous year. The reduction in hard coal production was 3.6%, and the reduction in lignite production was 2.7%. Hard coal imports were reduced 1.7% (Euracoal, 2015).

Thus, main pressure is supported by hard coal production. Being Poland the biggest hard coal producer of the EU with a 68.3% share, it will be the country to suffer more from all the factors that push the coal industry and coal-fired power generation.

Therefore, it is really important to provide an effective forecasting of energy resources prices in the context of energy security as well as conducted energy policy and management of the energy industry in countries where coal is an energy main raw material and the primary energy source.

This paper presents a one-year forecast of European thermal coal spot prices by means of time series analysis, using data from IHS McCloskey NW Europe Steam Coal marker (MCIS). The main purpose was to achieve a good fit for the data using a quick and feasible method and to establish the transformations that better suit this marker, together with an affordable way for its validation.

Also, in order to analyze the time series model performance a Generalized Regression Neural Network (GRNN) was used and its performance compared against the whole process. Finally, this analysis also allowed pointing out the main drivers that move the European Thermal Coal Spot prices.

Table 1 – EU gross energy inland consumption. Source: (European Commission, 2013).

Source	2011	2030 (scenario)
Renewables	10%	18%
Solid fuels	17%	12%
Nuclear	14%	14%
Gas	24%	22%
Oil	35%	33%