Energy Economics

Capital Depreciation in Efficiency Analysis and Regulation of Network Companies

Natural monopolies like network distribution companies are often subject to regulation of prices or income. Implementation of such regulation is often as a type of yardstick regulation where the comparison of performance is based on data envelopment analysis (DEA) or stochastic frontier analysis (SFA). The treatment of fixed capital (equipment) is these models has been criticized as historical investment cost data and tax depreciation rules are used to assess the capital as a factor of production. An interesting question is what, if any, consequences ignoring capital vintage and physical deprecation have for the results in an efficiency analysis and ultimately for the regulation of the network companies.

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Tariff Structures

The cost of electricity for an end-user consists of both an energy component and a connection payment for access to the grid and grid services. The design of the tariff has efficiency, distributional and investment consequences. As more production is occurring decentralized, new technologies are becoming available at affordable prices and in small "sizes" there is a legitimate question of if placing assets "behind the meter" makes economic sense for the private investor or owner. This decision is critically influenced by the tariff structure. The placement of new investments and assets not only influences the pay-off to the asset owner but may also influence the performance and costs of the entire system.

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Predicting Electricity Prices Using Machine Learning Methods

Predicting electricity prices in the short and long term is of importance to many economic agents. The ready availability of data and newer methods prediction/forecasting based on machine learning methods opens for potentially better forecasts. One technique which is emerging the use of the use hidden input-output Markov chain models. This can be applied to electricity prices (and other commodity prices as well). Knowledge of Python or R is expected.

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Electricity Consumption as Predictor for Economic Activity

Following the Great Recession (2007-2010) several economists noted the close relationship between economic activity and electricity consumption. Changes in electricity consumption, where data is readily available in real time, was believed to provide a good/better measure of economic activity and could as well serve as an early indicator of recessions. With the Covid-19 pandemic in early 2020 the drop in electricity consumption has been used to predict the ensuing economic activity. See, for example, Justin Wolfers' column in the NY Times

(https://www.nytimes.com/interactive/2020/04/08/upshot/electricity-usage-predict-coronavirus-recession.html). However, changes in electricity consumption across Europe does not seem to correlate well with changes in economic activity. A possible master thesis could be to relate changes in electricity consumption in European countries with changes in economic activity (GDP) over the same period.

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