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Valuation of an American option for the Spanish secondary reserve market using a machine learning model

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Abstract— This paper presents an original methodology to design a financial product that could enhance the demand side participation in ancillary services, especially for industrial consumers. The financial product consists in an American option on the Spanish secondary reserve market for the following day, where the buyer has the right, but not the obligation to offer part of their capacity to the system operator. Considering this approach, an industrial consumer would receive an economic incentive to offer its flexibility to the system without changing its production planning, paying an upfront premium. The computation of the American option is based on a Monte Carlo simulation approach where the random paths are obtained from a machine learning model. The machine learning model attempts to forecast the 24 hour secondary band prices of the following day using a combination of different algorithms; the output and the error of the model are used as a baseline to perform the Monte Carlo simulation that computes the option value.

Index Terms— Demand side management, electricity markets, American options, machine learning.

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