

# Inventory and pricing issues in media broadcasting

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## 1 Introduction

We consider in this talk the problem of simultaneously allocating advertising spots of a given broadcast television and determining the price associated with each spot. Each year, after a broadcast television announces its show schedule for the upcoming season, it faces requests from different companies or advertising agencies that want to have a certain amount of their advertisements broadcasted on the station's advertising time. Buying and selling advertising spots during the period following the schedule announcement composes the up-market. On the other hand, when the transaction occurs just before the broadcasting of the shows during which the negotiated spots are to be broadcasted, it is related to as the scatter market.

The price offers for a given spot during a show can vary between clients according to several factors: the client's fidelity, the amount of spots he wishes to buy, how early the client offers to buy them, the incertitude on the audience, etc. Each spot is also differentiated by its audience which may differently interest each client. The broadcaster has to arbitrate between different spot requests: they often outnumber the quantity of spots available for a given time slot (in particular in high audience period), competing companies can be interested in the same spots (e.g. Air France and EasyJet), etc.

Hence, the broadcast television faces two issues: inventory and pricing. Given a limited inventory of spots, the broadcaster should determine how he will split his inventory between the up-market and the scatter market and, according to the resources requested by the clients and the price schedule, how to select the advertisements broadcast. How should a broadcast television price its spots and allocate its advertising space in order to maximise its revenue? To tackle this problem, we develop a model based on bilevel programming paradigm where the agents involved in the process are explicitly modeled: the broadcast television, the competitors and the clients. At the upper level, the broadcaster jointly optimizes the price and inventory of the spots. On the demand side (lower level), we do not use econometric models, but rather assign client demands to the broadcaster or one of its competitors according to the availability of the broadcasters and their own preferences, expressed in terms of several criteria, including cost, expected audience and quality of the spots of each broadcaster. The bilevel framework allows modeling the interactions between a broadcast television and its customers through the price and the availability of the spots.

The resulting bilevel program involves a bilinear program at the upper level and a multiknapsack problem at the lower level. We use the notion of minimal set to characterize the inducible set. Exploiting the structure of the inducible set, we develop an exact algorithm and heuristics based on branch and bound and cuts generation. Numerical results are presented on medium size problems.

## References

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