$$\max_{b=[b_1,..b_N]} \sum_{i=1}^{N} v_i E[activations(i, b_i)] - \sum_{i=1}^{N}\sum_{j=1}^{M} C_{i,j} p_i(q_i, v_i)$$

$$s.t.$$

$$s_i = max\{ \sum_{j \in A \setminus \{i\}} min\{1, \left\lfloor \frac{q_i v_i}{Q_j V_j} \right\rfloor\}, S\} \quad \forall i \in N$$

N : #campaign
M : #nodes (customers)
S : #slots of the target slate
b_i : bid for campaign i
activations(b_i) : #node activated for campaign i with a bid b_i
v_i : value provided to the advertiser with a click on the advertise of campaign i
$C_{i,j}$: 1 if node i belong to category j, 0 otherwise
p_i : price of the advertise*, calculated with the VCG price. Since the publisher cant know the value of the advertiser, it may be needed to sobstitute v with b
s_i : position of the advertise i in the slate (0 if not present)
A : set of advertisers playing the auction

*se p_i non considera la probabilità di click bisogna moltiplicare nell objective function per $\lambda_s * q$