Net gain problem with two stops for an urn scheme

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In this paper, the following optimal double stopping problem on trajectories is considered. Suppose that there is an urn containing m balls of value -1 and p balls of value $+1$. The player is allowed to draw ball randomly, without replacement, one by one. The value -1 is attached to minus ball and value $+1$ to plus ball. Determine sequence $Z_0 = 0$, $Z_n = \sum_{k=1}^{n} X_k$, $1 \le n \le m+p$, where X_k is the value of the ball chosen at the k-th draw. The player observes the values of the balls and wants to make two stops. The aim of player is to maximize the expected gain, the gain is difference between maximum and minimum values of the trajectory formed by $\{Z_n\}_{n=0}^{m+p}$ (net gain problem).

This urn scheme could be considered as the buying-selling problem. Here the value of the ball is change of the cost of an asset. The first stop means the buying of an asset and the second stop is the selling of an asset. In net gain problem the player wants to maximize the difference between costs.

The urn schemes with one stop was considered by Shepp L. (1969) (net gain problem), Tamaki M. (2001) (max-problem), Mazalov V.V., Tamaki M. (2007) (duration problem).

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