

# An Expected Supremum Representation of the Value of an Optimal Stopping Problem: the two-boundary case

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## Abstract

We consider the representation of the value of an optimal stopping problem of a linear diffusion as an expected supremum of a known function. We establish an explicit integral representation of this function by utilizing the explicitly known joint probability distribution of the extremal processes. We also delineate circumstances under which the value of a stopping problem induces directly this representation and show how it is connected with the monotonicity of the generator.

We compare our findings with existing literature and show, for example, how our representation is linked to the smooth fit principle and how it coincides with the optimal stopping signal representation. The intricacies of the developed integral representation are explicitly illustrated in various examples arising in financial applications of optimal stopping.

The first part of our study focuses on the single stopping boundary setting where the optimal stopping decision is characterized by a single exercise boundary. The second part generalizes the treatment to a two-boundary framework and present some interesting intricacies arising in that setting.

The paper can be downloaded from <http://arxiv.org/abs/1505.01660>