

# Duality and Penalization in Optimization via an Augmented Lagrangian Function with Applications\*

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**Abstract.** This paper aims to establish duality and exact penalization results for a minimization problem of an extended real valued function in a reflexive Banach space in terms of a valley at 0 augmented Lagrangian function. It is shown that every weak limit point of a sequence of optimal solutions generated by valley at 0 augmented Lagrangian problems is a solution of the original problem. A zero duality gap property and an exact penalization representation between the primal problem and the valley at 0 augmented Lagrangian dual problem are obtained. These results are applied to variational problems that are related to the American option pricing problem.

**Key words:** Valley at 0 augmented Lagrangian function, zero duality gap, exact penalty function, reflexive Banach space.

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