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An Explicit Formula for Optimal Portfolios in Complete Wiener Driven Markets: a Functional Itô Calculus Approach

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Abstract

The optimal investment problem is one of the most important problems in mathematical finance. The main contribution of the present paper is an explicit formula for the optimal portfolio process. Our optimal investment problem is that of maximizing the expected value of a standard general utility function of terminal wealth in a standard complete Wiener driven financial market. In order to derive the formula for the optimal portfolio we use the recently developed functional Itô calculus and more specifically an explicit martingale representation theorem. A main component in the formula for the optimal portfolio is a vertical derivative with respect to the driving Wiener process. The vertical derivative is an important component of functional Itô calculus.

Keywords: Functional Itô calculus, Martingale representation, Optimal investment, Optimal portfolios, Portfolio theory, Utility maximization, Vertical derivative.

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