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Pricing European commodity swaptions

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Abstract

In this paper, formulas for commodity swaptions are presented. By utilizing the forward price based approach a simple closed form solution for European swaptions is derived based on the assumption of deterministic volatility for lognormal variables. The formulas result from applying the Margrabe (1978) exchange option concept to the present problem. A special case of constant volatility yields the Black (1976) formula that has been the market standard in the interest rate swaption markets for many years.

Notes

The figure comprises of OTC contracts for commodity forwards, swaps and options.

Convenience yield is defined as the benefit derived from holding the physical commodity instead of the futures contract on the underlying. Net convenience yield is convenience yield net of holding period storage costs.

The quotations for longer maturity swaps are usually average-based, which complicates the bootstrapping process.

The formula can be specified so that it uses annual notional and year fractions instead.

The forward floating price leg and the forward fixed price leg do not provide income before the start date of the spot swap, since convenience yields are already capitalized into the forward prices. This can be shown using Ito's Lemma.