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Asian options on the harmonic average

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1. Introduction

The contracts written on the harmonic average of the underlying price are quite popular in the foreign exchange market. If X denotes the foreign currency and Y denotes the domestic currency, the pay-off of the contract is a function of a price of an asset H which is defined as

$$H(T) = \left[\int_0^T [X_Y(t)]^{-1}\eta(t)dt\right]^{-1} Y(T) \quad \left[\frac{1}{\int_0^T X_Y(t)\eta(t)dt}\right] Y(T).$$

in the situation when the asset is required at time t for trading, hedging or settling a financial contract. The price of an asset is a pairwise relationship of two assets, which we denote by $X_Y(t)$: the number of assets Y required to obtain a unit of an asset X. The asset Y is known as a reference asset or as a numeraire. We will also use the relationship

$$X_Z(t) = X_Y(t) \cdot Y_Z(t),$$

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