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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

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

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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