

## Fall 2022 - Project

We would like to price a contract paying on the settlement date  $T + \Delta$  the payoff amount in USD, defined on the maturity date  $T$  as:

$$\max \left[ 0, \left( \frac{S(T)}{S(0)} - k \right) \cdot \left( k' - \frac{L(T, T, T + \Delta)}{L(0, T, T + \Delta)} \right) \right]$$

with:

- $S(t)$  the Nikkei-225 spot price at time  $t$ , *quantoed* from JPY into USD
- $L(t, T, T + \Delta)$  is the 3-month USD LIBOR rate between  $T$  and  $T + \Delta$ , observed at time  $t$
- $\Delta$  is a period of 3-month (0.25 years).  $T$  the maturity date (e.g. 3 years) and  $T + \Delta$  the settlement date (e.g. 3.25 years)
- $k, k'$  given relative strike prices (e.g. both could be 1.00 or ...)

Provide a pricing routine (e.g. Python script) calculating the price of this contract, taking as inputs: the deal terms  $(T, \Delta, k, k')$  and the relevant market data (interest rates, volatilities, spot prices, correlations ....).

Explain your precise assumptions and methodology choices clearly in an accompanying write-up.