Assignment 2.

1. Case study (Bootstrap for Euribor 3M Interbank curve):
Considering the interbank market on the 15th of February 2008 at 10:45 C.E.T. write a Matlab code that realizes the bootstrap for the Discount Factors' curve (with a single-curve model). CERCARE
Output values should be on settlement date and expiries of quoted underlyings.
Hints: Quale è l'underlying del future??

a. create a complete set of swap rates (with expiry after each year from 2y up to 50y with a *modified following* convention) from the ones in the excel file MktData_CurveBootstrap.xls.
b. include in the datesSet of the bootstrap only end dates of underlying contracts (included all swap rates in the complete set). Only the expiry date

Q: Bootstrap is not the only technique to obtain Discount Factors (DFs) from quoted rates. Why is it so relevant the bootstrap of DFs in finance? Domanda teorica su Chat GPT

2. Exercise (DV01 for an IRS, Modified duration for a coupon bond)
With the discount curve obtained above compute (the absolute value of the quantities specified below) for a portfolio composed only by one single swap, a 6y plain vanilla IR swap *vs* Euribor 3m with a fixed rate 2.8173% and a Notional of €10 Mln:
i) DV01-parallel shift;
ii) DV01$^{(z)}$-parallel shift;
iii) BPV of the 6y IRS;
and for "I.B. coupon bond" with same expiry, fixed rate & reset dates of the IRS, and face value equal to IRS Notional:
iv) its Macaulay Duration.
Comment the results.

3. Theoretical Exercise
Price a 6y "I.B. coupon bond" issued on the 15th of Feb '2008 with coupon rate equal to the corresponding mid-market 7y swap rate. Assume for the coupons a 30/360 European day count.
Hint: Shortcuts are appreciated.

4. Theoretical Exercise
Show that Garman–Kohlhagen formula for a European Call option holds for an underlying with interest rates, continuous dividends and volatilities deterministic functions of time. In particular the formula is exactly the same considering their average value over the time-to-maturity instead of the constant values in the "standard formula".

Function signatures

a. [dates, discounts]=bootstrap(datesSet, ratesSet);
b. zRates = zeroRates(dates, discounts); (in percentage unit, e.g. 2.13 stands for 2.13%)

c. [DV01, BPV, DV01_z] = sensSwap(setDate, fixedLegPaymentDates, fixedRate, dates, discounts,discounts_DV01); (discounts_DV01 are computed in order to determine the DV01)
d. MacD = sensCouponBond(setDate, couponPaymentDates, fixedRate, dates, discounts).