Executive Master Program Data Science for Finance

Fixed Income Securities

INDIVIDUAL PROJECT ASSIGNEMENT, 2020-21

1. Consider a government **inflation linked bond** with the following term sheet:

Notional amount	1000
Coupon Type	Fixed
Coupon rate	3.75%
Coupon frequency	Semi-annual
Currency	USD
Issue Date	31/7/2015
Maturity Date	15/7/2025
Trade Date	24/10/2015
Settlement Lag	T+1
Day Count	Act/Act
Inflation Reference Index	CONSUMER PRICE INDEX US
Inflation Reference Index Level at issue	237.14365
Inflation Reference Index Level at Settlement	237.46721

Assume the CPI index I_t follows a log-normal model (geometric Brownian motion), i.e.,

$$\frac{dI_t}{I_t} = \mu dt + \sigma dW_t,$$

where W_t is a Wiener process, μ the constant drift, and $\sigma > 0$ is the diffusion coefficient with estimates $\hat{\mu} = 0.03513$ and $\hat{\sigma} = 0.022439$.

Assume the issuers yield curve on the valuation date is given by the Nelson–Siegel-Svensson zero-coupon rate function parameters,

β_0	β_1	β_2	β_3	τ_1	τ_2
5.9%	-1.6%	-0.5%	1%	5	0.5

Tasks:

a) Compute the accrued interest.

b) Simulate 1000 scenarios for the inflation rate curve and CPI index

c) For each scenario, compute the inflation linked bond cash flows and estimate the fair value.

d) Summarise and analyse the inflation linked bond price distribution, including risk measures

PROJECT MILESTONES/REPORTS

A single individual written printed report must be submitted no later than November 7, 2020 (use the Professor Mail box N.º 16 at NOVA IMS, 2nd floor). Additionally, you are asked to send the Word & EXCEL & RScript / Python files by email: jbravo@novaims.unl.pt