|  |  |
| --- | --- |
|  | **Master in Finance**  **Case Studies in Financial Engineering** |

**Date:** 02/02/2021 **Time to complete the exam:** 1:30 hours

**Exam PART B (130 points)**

Please consider the Case Studies provided and answer in a straightforward way to the following questions:

1. How can the yield curve be used to predict recessions and the future level of reference rates of central banks, by also taking into account the explanatory theories of the term structure of interest rates. **(30 points)**

* The slope of the yield curve can be considered as a leading indicator of the business cycle, in the sense that a positively sloped yield curve mat embed expectations about future increases of short-term interest rates, which usually happen during the upward stages of the business cycle, as a consequence of monetary policy decisions to tackle inflationary pressures.
* This perspective is based on the expectations theory of the term structure of interest rates, that states that long-term interest rates result from the current level and expectations about the future path of short-term interest rates.

1. Present and discuss two alternative and adequate static methods to estimate the yield curve, identifying their major pros and cons. **(25 points)**

* Polynomial or Nelson-Siegel/Svensson methods can be considered.

1. Describe how to compute the price of a futures contract on the 3-month Euribor rate with settlement next June. **(20 points)**



Being m = 4/12 and n=0,25

The spot rate should be obtained from fitting the yield curve (e.g. by using one of the methods characterised in the previous question), resulting from yields to maturity of coupon-paying bonds, as usually zero-coupon bonds beyond the 1-year maturity are not available.

1. Characterize the structured products presented in the cases, namely by identifying the options embedded and the upside and risks for investors. **(30 points)**

* Both products correspond to a zero-coupon bond plus long positions in call-options, but the DB product also includes a short-position in a put-option for large market downturns.
* The product issued by the swiss bank includes a plain vanilla call-option and the return corresponds to half of the option payoff, with a cap (that corresponds to a short position in a put option, with a strike price equal to underlying asset value where the cap is placed.

1. Describe how to assess the probability of losing more than 20% of the amount invested in each of the structured products. **(25 points)**

* In the first product, it is not possible to lose 20%, only 35% or more. Therefore, the probability of losing more than 20% corresponds to the one of losing at least 35% => N(d2), with the strike price in d2 equal to the underlying asset price 35% below the initial strike price.
* In the second product, there is no chance to lose, as the capital invested is fully protected.