

# ALM 2017

## 1. Interest rate analysis

Today is 1st January 2013. You find the following report on government bonds:

Last trading date		
31.12.2012		
Bond maturity	Coupon rate (annual coupons)	Bond yield (annual compounding)
31.12.2013	5,00 %	7,945607 %
31.12.2014	5,00 %	7,616424 %
31.12.2015	5,00 %	7,333579 %
31.12.2016	5,00 %	7,091740 %
31.12.2017	5,00 %	6,885408 %
31.12.2018	5,00 %	6,709395 %
31.12.2019	5,00 %	6,559044 %
31.12.2020	5,00 %	6,430306 %
31.12.2021	5,00 %	6,319723 %
31.12.2022	5,00 %	6,224383 %

- 1.1 Determine the term structure of zero rates (the yield curve).
- 1.2 Determine forward rates that are consistent with the zero rates.
- 1.3 Produce a graph showing the zero rates and forward rates.
- 1.4 What does one call a yield curve that has a shape as this one?

Please state all interest rates with continuous compounding.

## 2. Liability funding

Today is still 1st January 2013. You want buy bonds to fund a 10-year fixed annuity of €1,000,000 per year, starting 31.12.13.

- 2.1 Determine the portfolio of bonds that replicates the liability cash flow.
- 2.2 Determine the portfolio of bonds with maturity in 3-5-10 years that matches the present value, duration and convexity of the liability cash flow.

Please use continuously compounding interest rates in all calculations.