

Master in Mathematical Finance

Interest Rate and Credit Risk Models

Exam – 9 January 2017

Time: 2:15h

1. Please consider the following information on the Euro area money market and Government debt yields for the 5th January 2017:

Interest rates (%)

Maturities	Euribor	Germany	Portugal
Overnight	-0,42		
1 week	-0,42		
1month	-0,33		
3 months	-0,31		
6 months	-0,23		
1 year	-0,115		
2 years		-0,773	0,085
5 years		-0,522	1,883
10 years		0,27	3,903

- 1.1. Compute the price of a futures contract for the 3-month Euribor, with expiry date in April 2017. (1,5/20)
- 1.2. Considering that the 5 and 10 year maturities of the Portuguese Government debt are represented by bonds paying annual coupons, with a redemption value of 100 Euros and coupon rates of 2% and 3%, respectively, compute the number of 10 year bonds to use in a duration hedging strategy of a portfolio comprised by 1000 bonds representative of the 5-year maturity. (1,5/20)
- 1.3. Assuming that the 2-year Portuguese Government bond has a redemption value of 100 Euros and an annual coupon rate of 1,5%, compute the 2-year spot rate using a bootstrapping methodology and identify the main conceptual differences to the yield to maturity. (1,5/20)

- 1.4. Considering the main explanatory theories of the term structure of interest rates, characterize the major differences between the German and the Portuguese yield curve regarding the expectations on the future behavior of short-term rates (2,5/20)
- 1.5. How could you estimate the future path of Euribor interest rates, by using static and stochastic interest rate models? Please present briefly the main features of the models identified. (3/20)
2. Please consider the following marginal probabilities of default for company CorpCo (in addition to the interest rate information on the Portuguese Government Debt provided in the previous Group):

Maturity (years)	Prob.Default
1	0,62%
2	1,31%

- 2.1. Compute the premium of a credit default swap with the following features: (2/20)
- Maturity = 2 years
- Notional = € 100.000
- Payment in case of default = 60% of the notional
- 2.2. Please explain how would you assess CorpCo credit risk from its share prices and identify the information required accordingly. (2/20)
- 2.3. How could you model the PD of the company using reduced form models? (2/20)
- 2.4. Assuming that there are only 3 ratings classifications – investment grade (I), speculative grade (S) and default (D) – and CorpCo has a classification of “I”, compute the 2-year probability of default, taking into consideration the rating transition matrix below and the potential rating migrations. (1,5/20)

	I	S	D
I	0,7	0,25	0,05
S	0,2	0,7	0,1
D	0	0	1

- 2.5. Please explain how does the correlation impact on the credit risk of a bond or loan portfolio (2,5).