



**I (6,0/20)**

Choose the answer that you consider to be more correct to each of the next questions:  
**(1,5/20 for each question, with a penalty of 0,25/20 for wrong answers)**

1. The European Banking Union involved:
  - a. the assignment to the ECB of banking supervision tasks to all banks based in the European Union;
  - b. the assignment to the ECB of the regulatory role in the Euro Area;
  - c. the setting-up of a system based on 3 pillars, where the ECB became responsible for the supervision and regulation of all Euro Area banks;
  - d. the foundation of several new Euro Area institutions, namely focused on prudential supervision, banks' resolution and deposit insurance.
2. Capital Requirements for banks based in the Euro Area:
  - a. result from the economic capital computed by banks;
  - b. result from the utilization of regulatory risk-weights or from regulatory formulas where banks may use internal estimations for PDs and LGDs;
  - c. correspond to the pillar I and pillar II requirements, considering also the systemic relevance of the banks;
  - d. became more demanding with Basel III, due to the imposition of new capital buffers and new leverage and liquidity ratios.
3. Interest rates charged on loans:
  - a. depend mostly on the reference rates set by central banks;
  - b. are a function of the loans' credit risk, measured by the volume of defaults a bank faces;
  - c. contain a spread that reflects mostly loans' credit risk;
  - d. depend on a set of variables, being the spreads charged in floating rate loans a function of credit risk, the costs faced by banks and the remuneration to be ensured to shareholders.
4. Credit risk losses for banks occur:
  - a. when loans' installments ceased to be paid, impacting adversely on the net interest income;
  - b. due to banks' shortcomings in their credit risk assessment procedures;
  - c. when banks anticipate significant increases in credit risk of loans;
  - d. when loans become non-performing, impacting on impairments.

## II (5,0/20)

Considering the information below about a portfolio of 100 loans, ordered by decreasing order of classification according to the original Altman Z-Score model:

No. Defaults	Z-Score
0	20
1	18
0	16
1	14
1	12
0	10
1	8
0	5
2	3
4	1

1. Characterize the credit risk model mentioned, describing its variables, explaining in which sense does this model use information from the stock market and identifying the main differences to the Merton model. **(2,5/20)**
2. Assess the adequacy of the model by computing the Kolmogorov-Smirnov indicator using the data available, describing the main features of this indicator. **(2,5/20)**

## III (9,0/20)

Considering a bank portfolio of homogeneous corporate loans, comprising 1000 contracts, each with a value of 10 Million €, compute and interpret the results of the following questions:

1. The 1-year Credit-VaR at 99% level of confidence, as well as the unexpected and the expected losses, under the Gaussian Copula hypothesis and assuming the following data: **(3,0/20)**

1y PD = 4%

Correlation coefficient ( $\rho$ ) = 0.01

Recovery Rate (RR) = 60%

2. The premium of a 2-year credit default swap on the loan portfolio, assuming that interest rates are 3% for all relevant maturities, the hazard and the recovery rates correspond to the 1y PD and the RR mentioned in the previous question and all potential defaults occur at the end of a year. **(3,0/20)**
3. Considering the following information about the performance of the loan portfolio, compute the cumulative observed and Kaplan-Meier probabilities of default (being  $h_i$  the number of defaults during each year  $i$  and  $n_i$  the number of existing loans at the end of each year) and explain the relevance of the Kaplan-Meier probabilities of default vis-à-vis the cumulative probabilities. **(3,0/20)**

Maturity (Years from today)	$h_i$	$n_i$
1	0	1000
2	0	970
3	1	969
4	1	900
5	2	890

Enjoy your work!