

FinMath 36702 Assignment 1 Due 6pm 30 March 2023.

Lisheng will discuss strategies for solving these questions in the TA session on Sunday March 26, and he will present full solutions on April 2. Please submit your homework as detailed in "FINM 36702 Assignment Submission Instructions," located on Canvas.

State numerical answers to precision of 2 significant digits. For example, if the exact answer is $\pi/2$, then the answer to 2-digit precision is 1.6.

Question 1. Suppose three firms have PD's and PDJ's as follows:

PD ₁	PD ₂	PD ₃	PDJ _{1,2}	PDJ _{1,3}	PDJ _{2,3}
0.1	0.2	0.3	0.06	0.06	0.06

Find the three values of correlation, $\rho_{1,2}$, $\rho_{1,3}$, and $\rho_{2,3}$ and find the three values of default correlation, $\text{Corr}[D_1, D_2]$, $\text{Corr}[D_1, D_3]$, and $\text{Corr}[D_2, D_3]$.

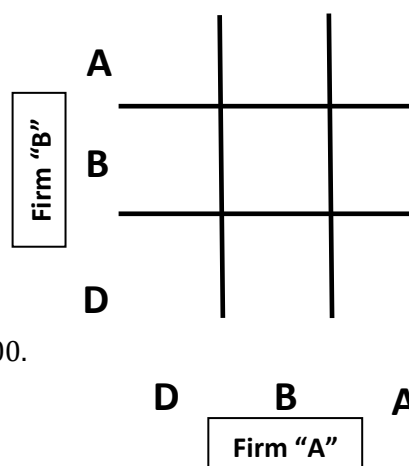
Question 2. Suppose that each of three firms have PD = 0.10 and that the correlations are

$$\begin{pmatrix} 1 & .4 & .5 \\ .4 & 1 & .6 \\ .5 & .6 & 1 \end{pmatrix}.$$

State the three values of PDJ. State the range of possible values for the probability that all three of the firms default. State the probability that all three default under the Gauss copula.

Question 3. Suppose a firm rated A has correlation 0.4 with a firm rated B. In the following period, Firm A remains rated A with prob = 0.5, and so forth:

Transition probabilities			
Initial rating	Final rating = A	Final rating = B	Final rating = D
A	0.5	0.4	0.1
B	0.3	0.5	0.2



In your answer file, create a three-by-three grid such as here. Fill in the cells with probabilities of final rating that sum to 1.00. Two digits of accuracy is sufficient, e.g., 0.66. Assume that transitions obey a Gauss copula.

Question 4. Suppose that four firms have PDs equal to 1%, 2%, 3%, and 4% and the probability that any given pair defaults equals 0.1%. What is the matrix of correlations? Explain whether the connection between the defaults of the four firms is consistent or not consistent with a Gauss copula.