

FinMath 36702 Homework 1 Due 6pm 6 April 2022.

Lisheng will discuss strategies for solving these questions in the TA session on April 3, and he will present full solutions on April 10. Please submit homeworks as detailed in “FINM36702 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 three firms each have PD = 0.10 and that the Gauss copula 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.

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

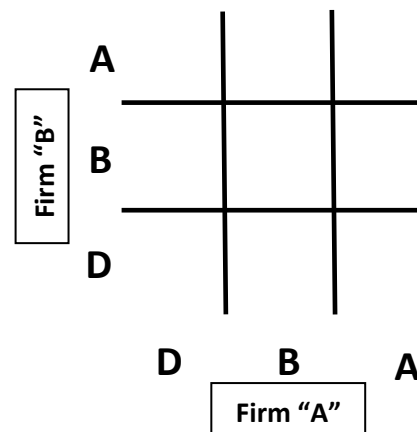
Transition probabilities			
	A	B	D
A	0.5	0.4	0.1
B	0.3	0.5	0.2

In your answer file, create a three-by-three grid such as here.

Fill in the cells with probabilities that sum to 1.00.

Two digits of accuracy is sufficient, e.g., 0.66.

Assume that all transitions obey a Gauss copula.



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 why the defaults of the four firms can or cannot be connected by a Gauss copula.