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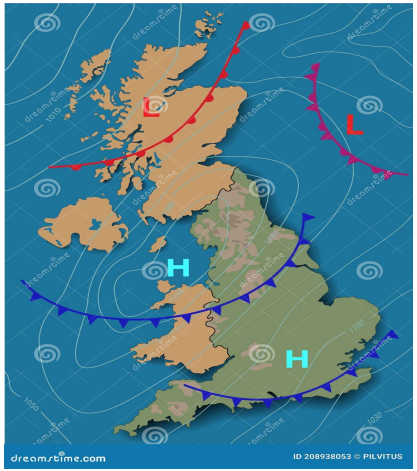
Projet QRM :
La dépendance entre l'humidité et la température en Angleterre

Sommaire

0/ Introduction

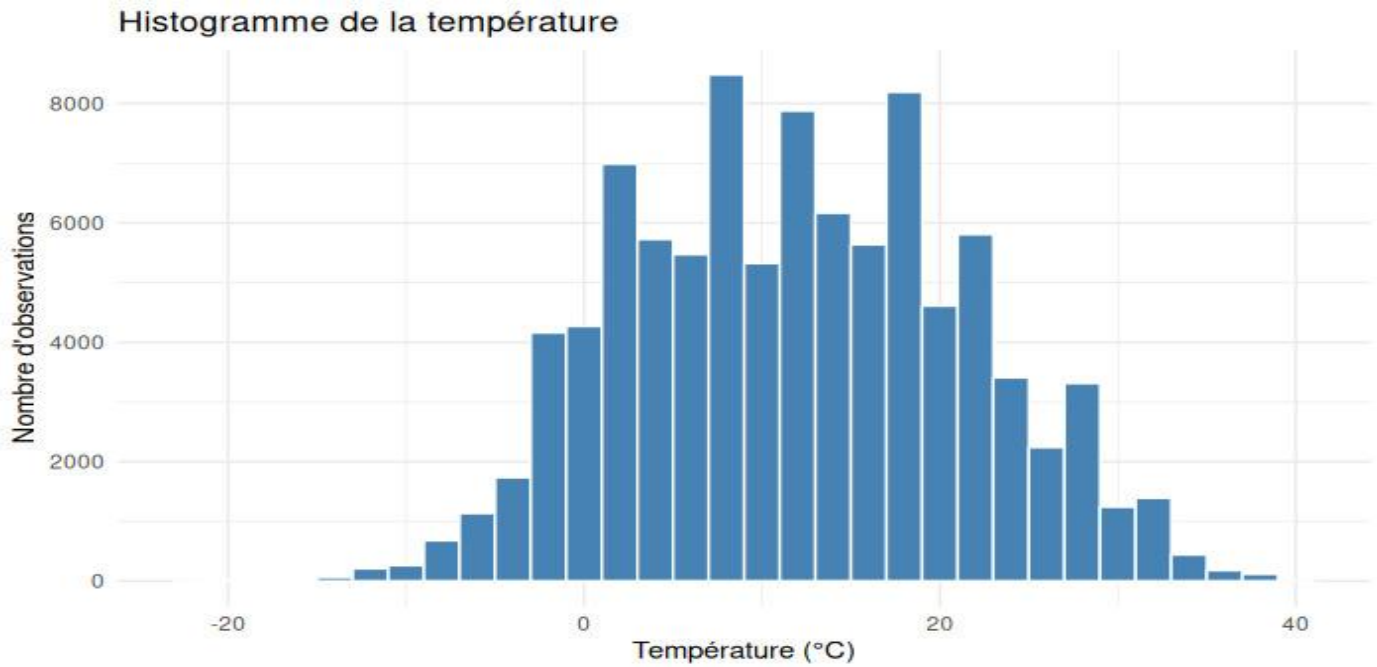


Carte du Royaume-uni

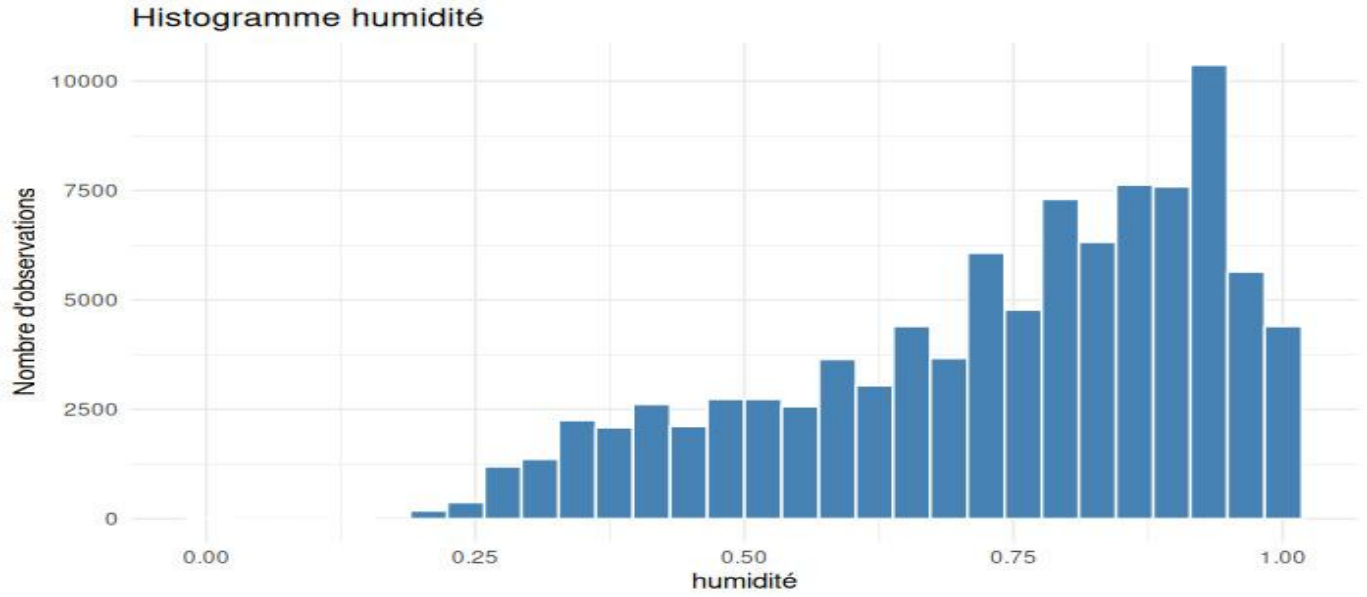
Hygromètre et Thermomètre

I. Présentation des données

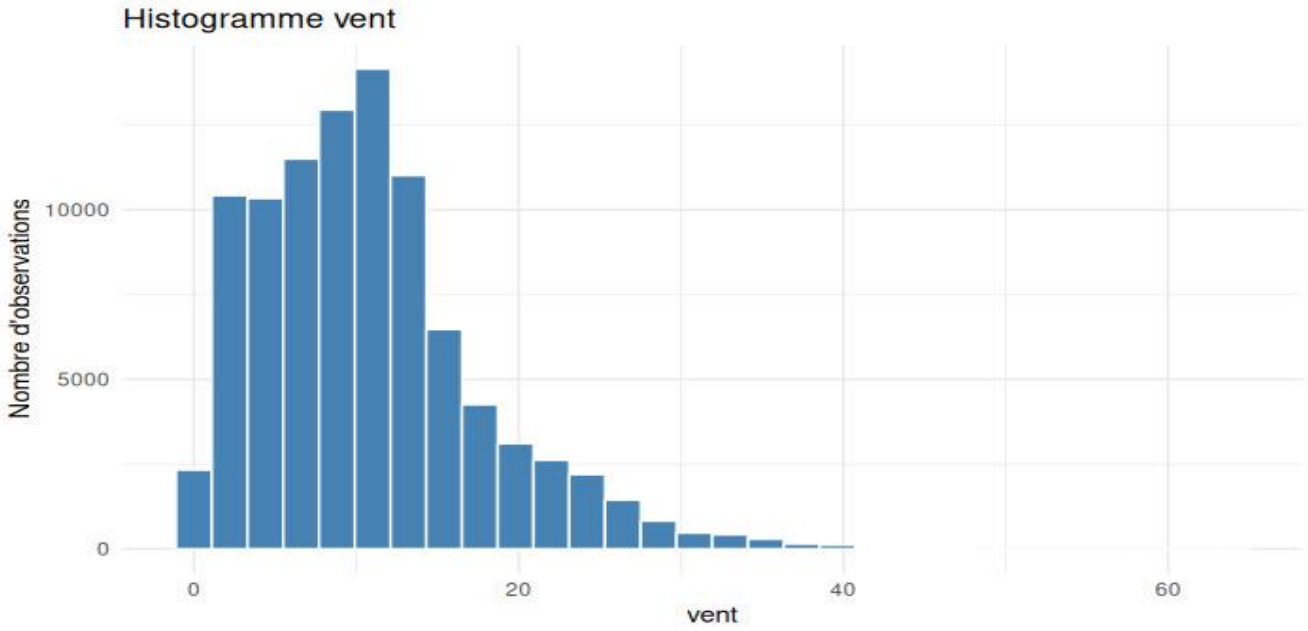
🌡️ Température



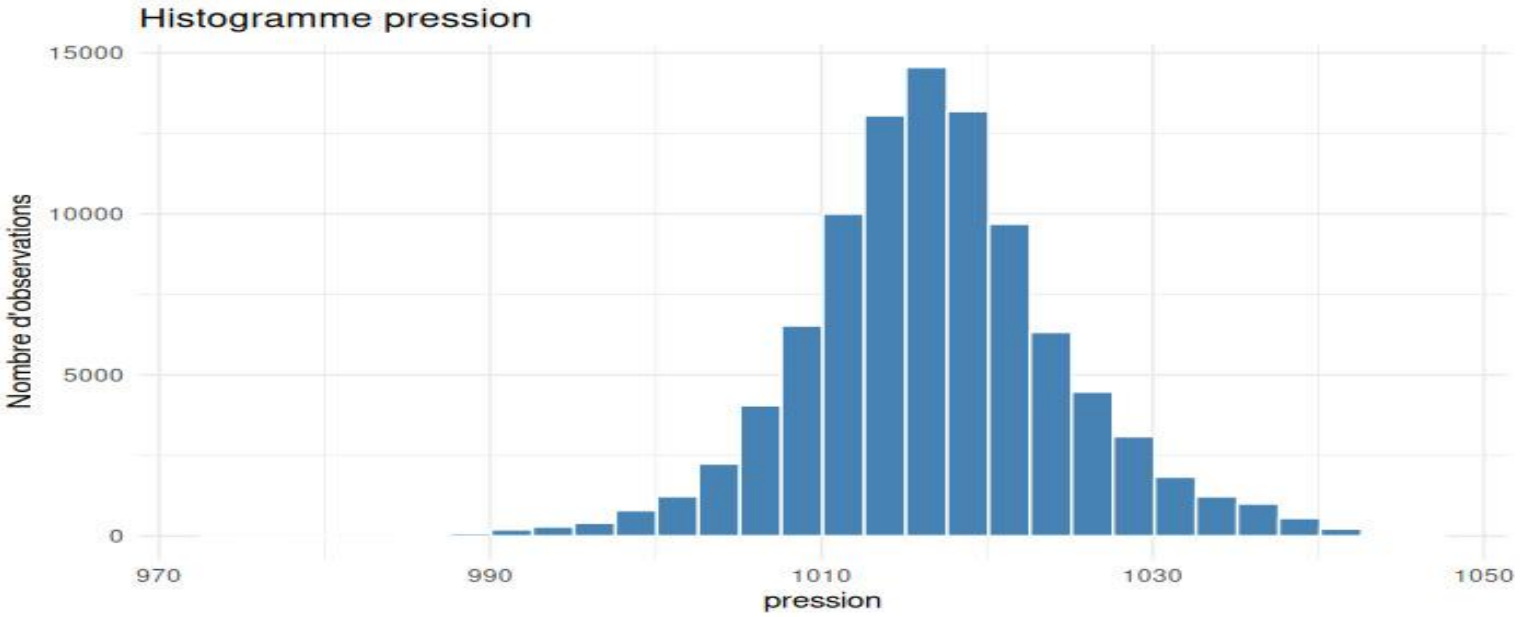
💧 Humidité

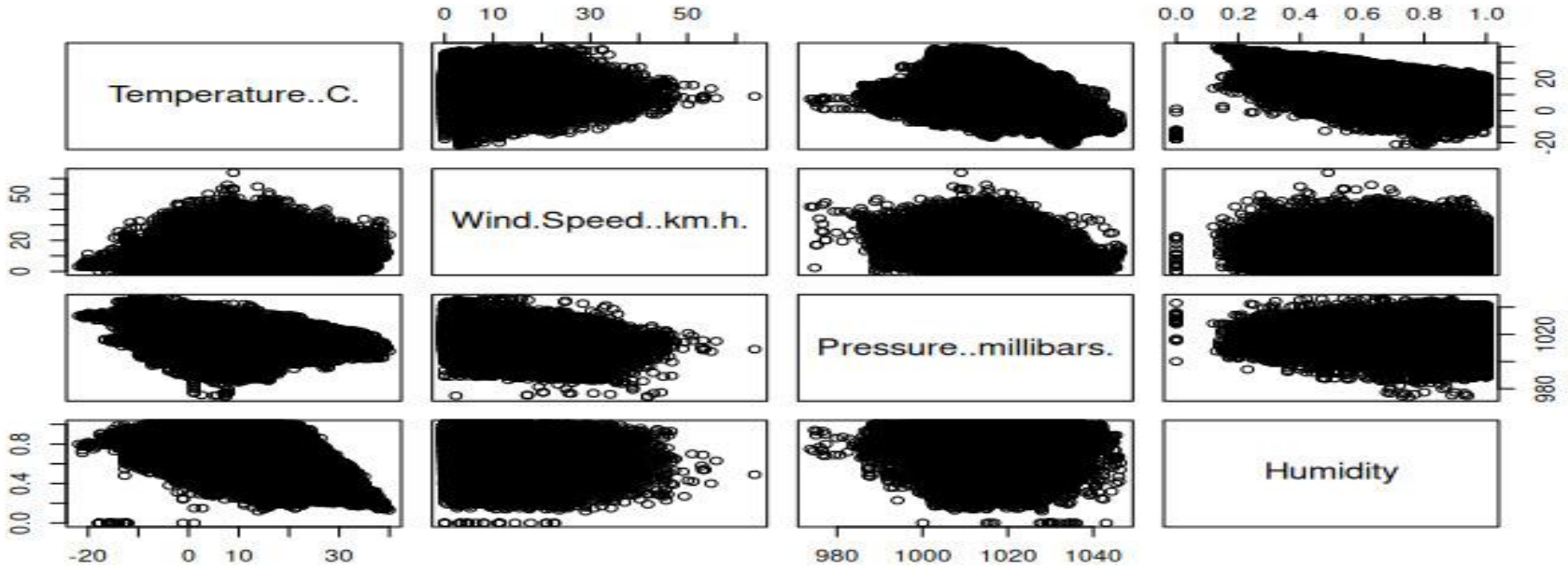

Histogramme humidité
Nombre d'observations
10000
7500
5000
2500
0
0.00
0.25
0.50
0.75
1.00
humidité

Vent

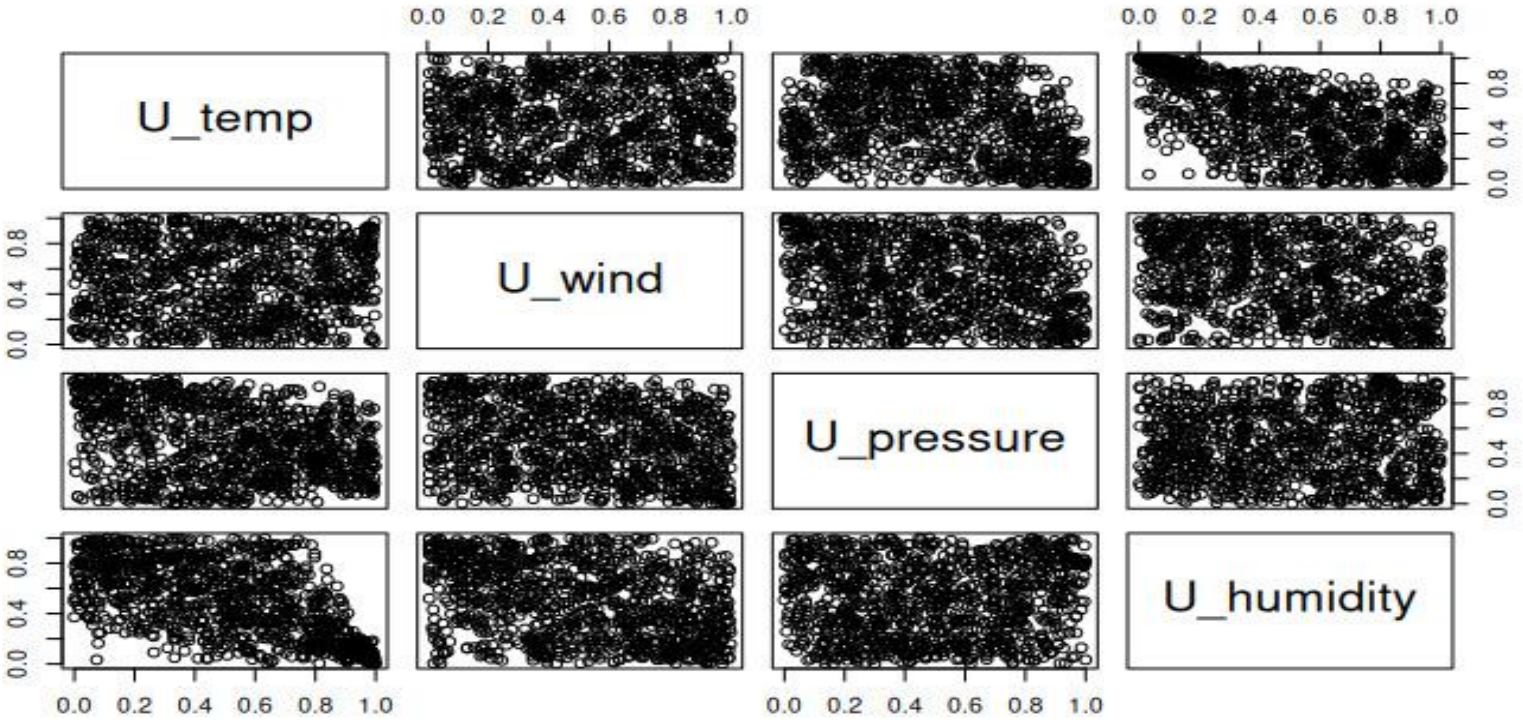

Histogramme vent
Nombre d'observations
10000
5000
0
0
20
40
60
vent

⬇️ Pression


Histogramme pression
15000
10000
5000
0
Nombre d'observations
970
990
1010
1030
1050
pression



Nuage de points



Nuage de points uniformisés

II. Tests de dépendance

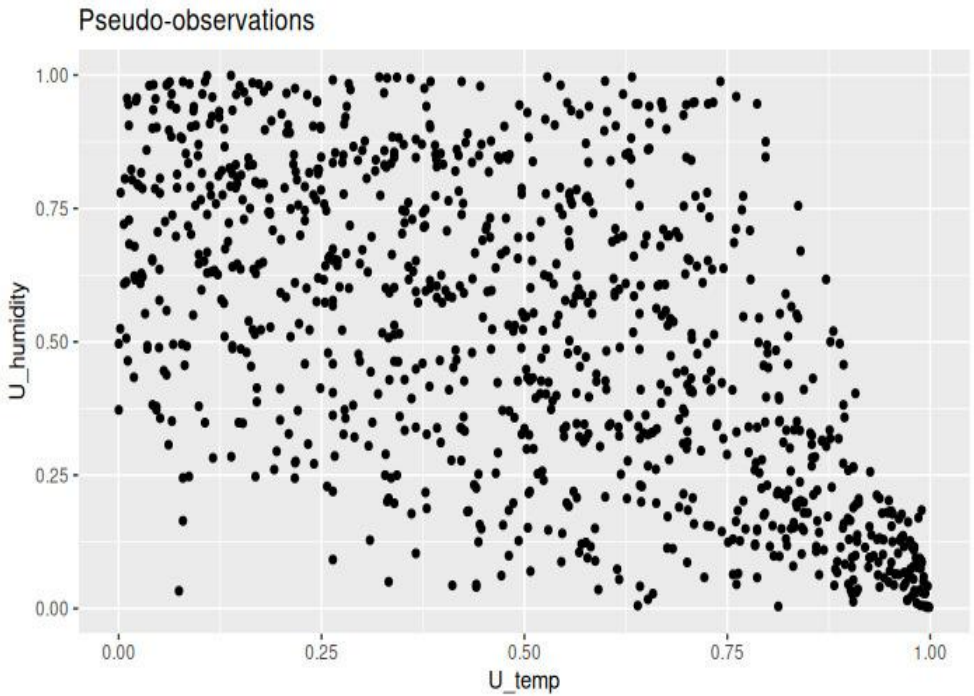
Test de Pearson

	U_temp	U_wind	U_pressure	U_humidity
U_temp	1.00000000	0.01802142	-0.31445612	-0.59005849
U_wind	0.01802142	1.00000000	-0.22792372	-0.26111968
U_pressure	-0.31445612	-0.22792372	1.00000000	0.04345612
U_humidity	-0.59005849	-0.26111968	0.04345612	1.00000000

Test de Kendall

	U_temp	U_wind	U_pressure	U_humidity
U_temp	1.00000000	0.01239321	-0.21181163	-0.41535673
U_wind	0.01239321	1.00000000	-0.15363185	-0.17491450
U_pressure	-0.21181163	-0.15363185	1.00000000	0.02921515
U_humidity	-0.41535673	-0.17491450	0.02921515	1.00000000

III. Présentation du nuage de points



Hyp 1 : Copule de clayton tournée de 270°

Hyp 2 : Copule de Gumbel tournée de 90°

Hyp 3 : Copule de Frank tournée de 270°

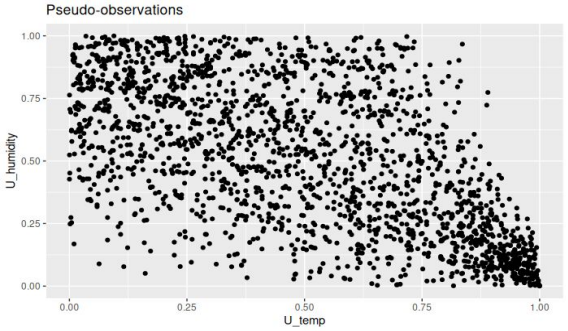
IV. Choix de la copule

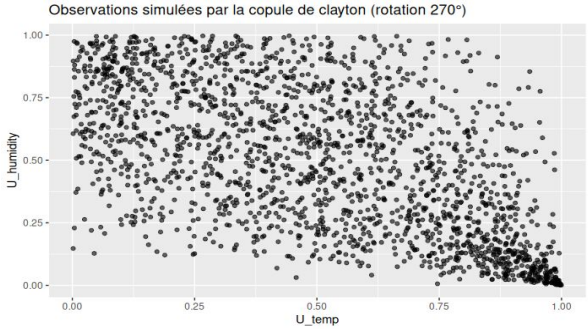
Dépendance

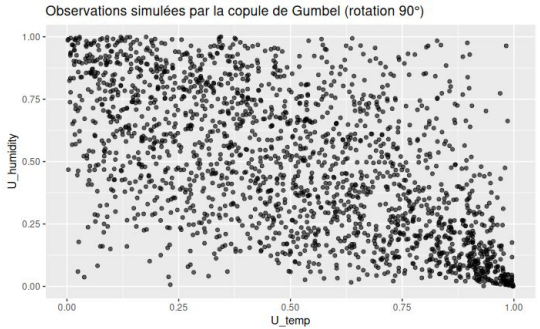
q	λ̂ UL (sup-gauche)	λ̂ LR (inf-droit)
0.10	0.5588	0.2231
0.05	0.4433	0.0895
0.01	0.3385	0.0053

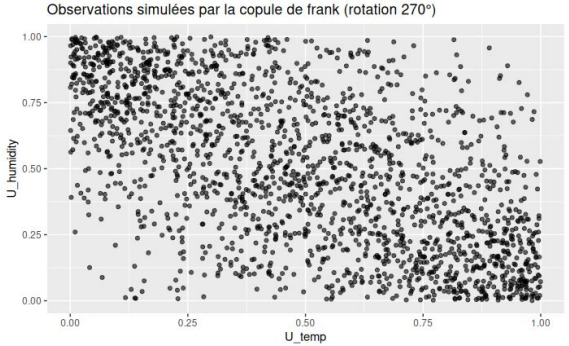
Comparaison

Copule	Formule	AIC
Copule de Clayton	$C_\theta^{270}(u,v) = u - \left(u^{-\theta} + (1-v)^{-\theta} - 1\right)^{-1/\theta}$	-49168.62
Copule de Gumbel	$C_\theta^{90}(u,v) = v - \exp\left(-\left[(-\ln(1-u))^\theta + (-\ln v)^\theta\right]^{1/\theta}\right)$	-47758.08
Copule de Frank	$C_\theta^{270}(u,v) = u + \frac{1}{\theta}\ln\left(1 + \frac{(e^{-\theta u}-1)(e^{-\theta(1-v)}-1)}{e^{-\theta}-1}\right)$	-39612.39

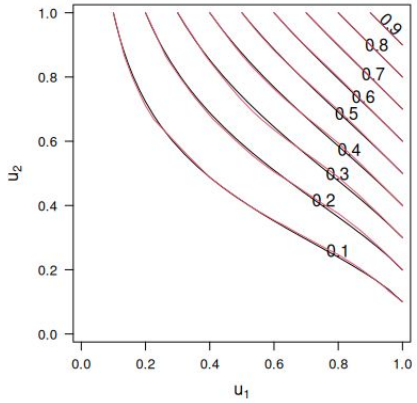

Pseudo-observations
U_humidity
U_temp
0.00
0.25
0.50
0.75
1.00


Observations simulées par la copule de clayton (rotation 270°)
U_humidity
U_temp
0.00
0.25
0.50
0.75
1.00

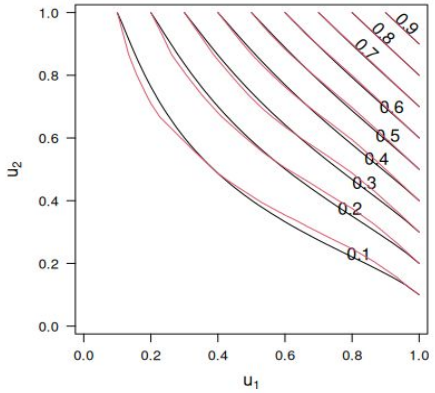

Observations simulées par la copule de Gumbel (rotation 90°)
U_humidity
U_temp
0.00
0.25
0.50
0.75
1.00


Observations simulées par la copule de frank (rotation 270°)
U_humidity
U_temp
0.00
0.25
0.50
0.75
1.00

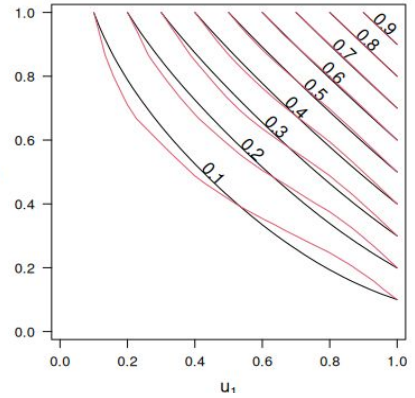
Comparaison entre copule Clayton ajustée et copule empirique



Clayton



Gumbel



Frank

V. Conclusion

Questions