









32

;

33 t t t t t t v

;

331 t

;

$$\pi(\theta, \dots) = \pi(\theta) \pi(\dots) \pi(\dots), \quad ( )$$

;

332 t t

;

$$(\pi(\theta, \dots | \dots)) = (\pi(\theta)) + (\pi(\dots)) + (\pi(\dots))$$

$$+ \sum_{\dots} (\dots, v; \theta) + \sum_{\dots} (\dots; \dots) + \sum_{\dots} (\dots; \dots),$$

( )

;



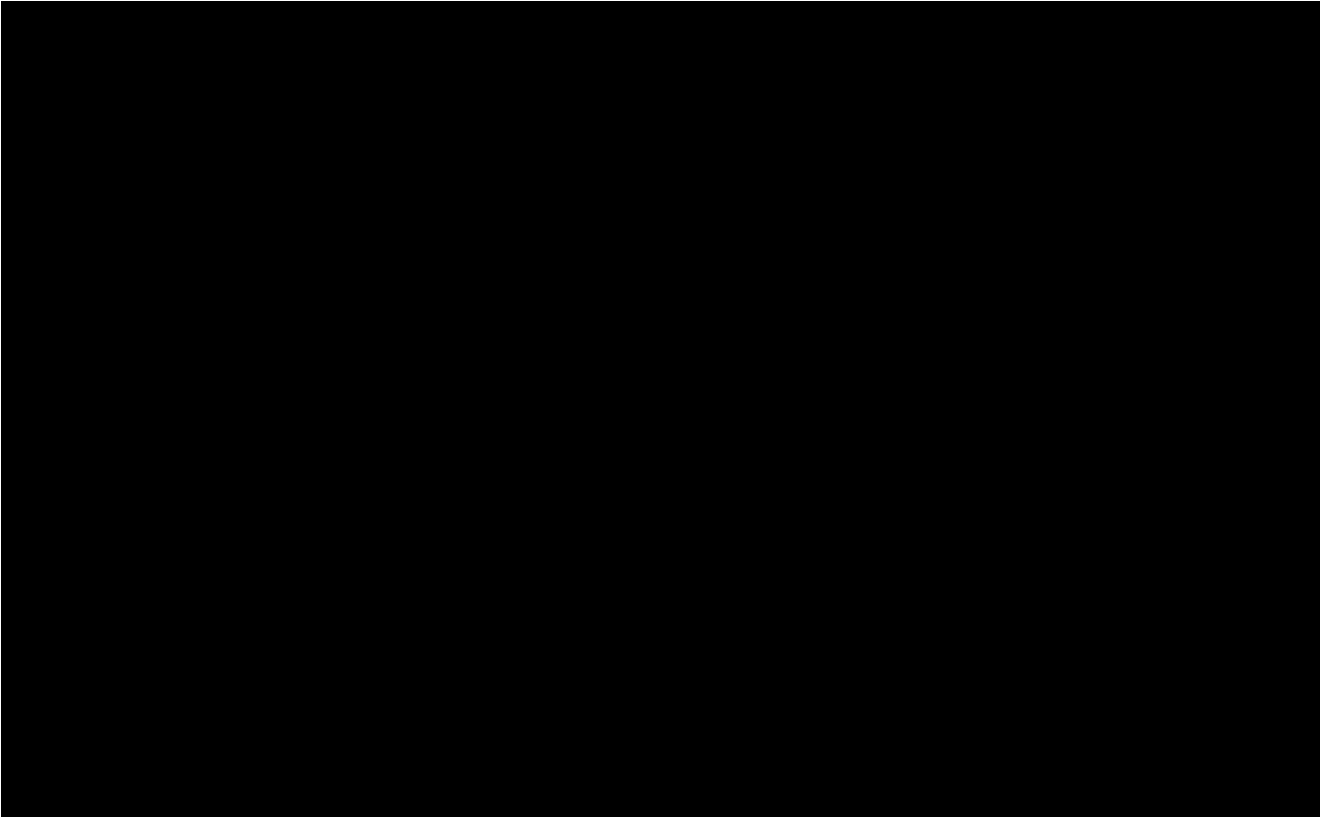


Fig. 2.  $\phi(\omega)$

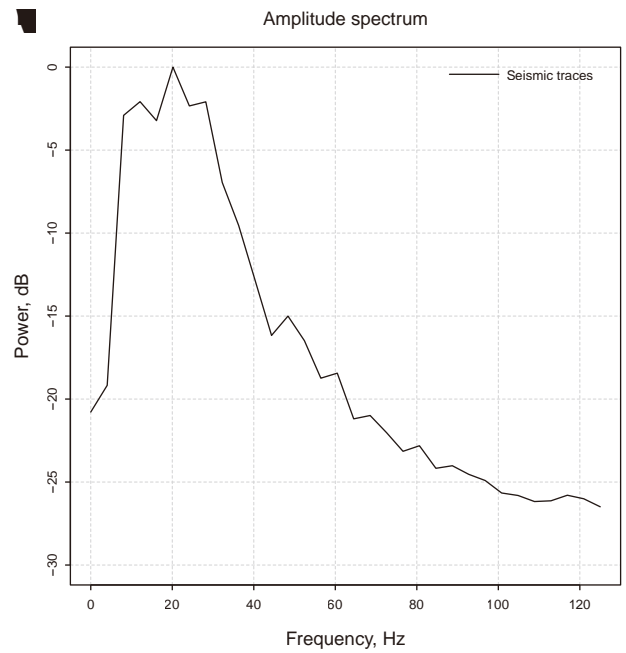
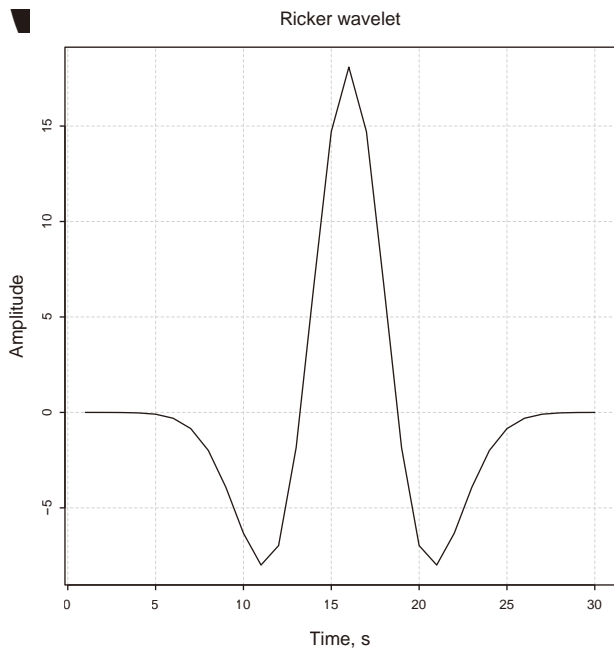


Fig. 3.  $\phi(\omega)$

3 t t 500 (6) 0000 50 375 000 6 (6)



$\mathbf{m} \sim \pi(\mathbf{m}; \boldsymbol{\mu}, \boldsymbol{\sigma}, \lambda, \theta)$

$$\mathbb{P}(\mathbf{m}) = \pi(\boldsymbol{\mu}, \boldsymbol{\sigma}, \lambda, \theta) \quad (6)$$

$\mathbf{d} | \mathbf{m} \sim \pi(\mathbf{d}; \mathbf{m}, \boldsymbol{\mu}, \boldsymbol{\sigma})$

$$\mathbb{P}(\mathbf{d} | \mathbf{m}) = \pi(\mathbf{d}; \mathbf{m}, \boldsymbol{\mu}, \boldsymbol{\sigma})$$

Table 3

	$\mu$	$\sigma$	$\lambda$	$\theta$
	8837	0.50	9373	-6.65
	800	800	800	-
	880	0.5	900	-600
	700	700	700	300
	8790	0.5	9330	-000



Fig. 7. (a)  $\phi$  (e) (b)  $\phi$  (c) (d)  $\phi$  (f) (g)







0 0 ; 0 ;  
C C ;  
3 ; 0 ;  
0 0 0 ;  
C ) 0 ( ;  
0 0 0 ;  
00 ; 3 ;  
; ; 0 ;

Appendix A. Parametric Archimedean copula models

$$C(t_1, \dots, t_d) = \Phi_{\theta}(\Phi_{\theta}^{-1}(t_1), \dots, \Phi_{\theta}^{-1}(t_d))$$

$$(\cdot, \cdot) = (\cdot, \cdot),$$

CRedit authorship contribution statement

Daniel Vázquez-Ramírez;  
 Martín A. Díaz-Viera; &  
 Raúl del Valle-García; &

Supplementary material

(0.9)

Declaration of competing interests

Acknowledgments

C-00 7305

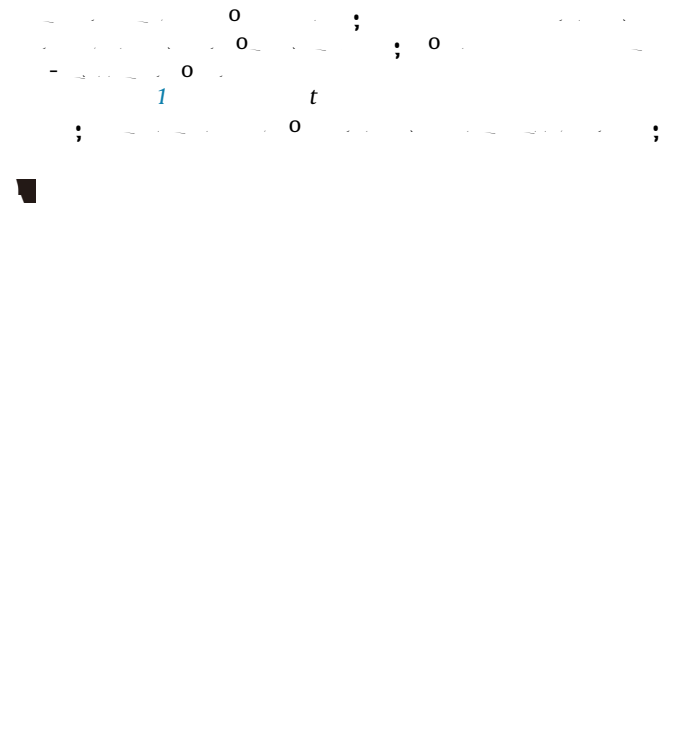
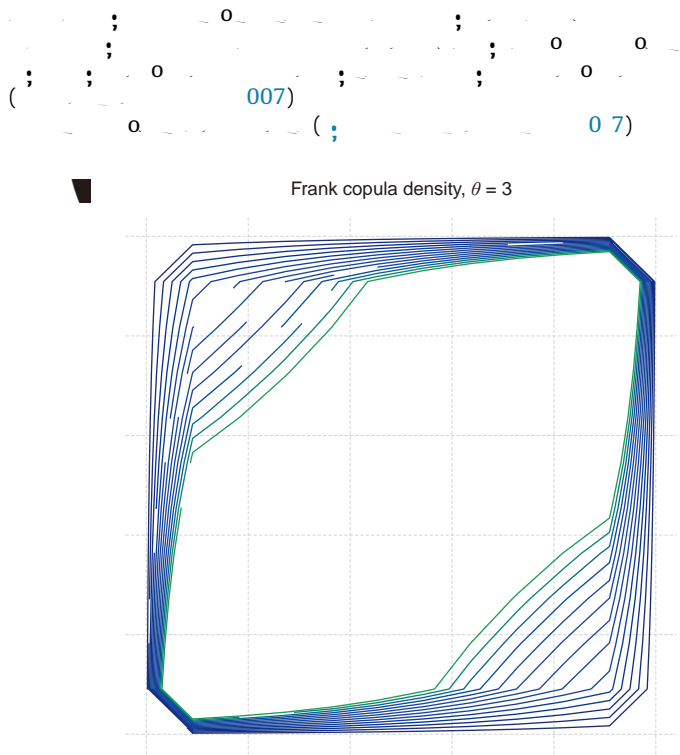


Fig. A.1. (a) (b)

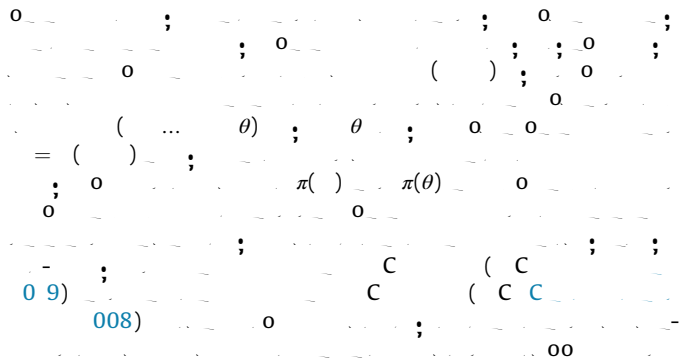
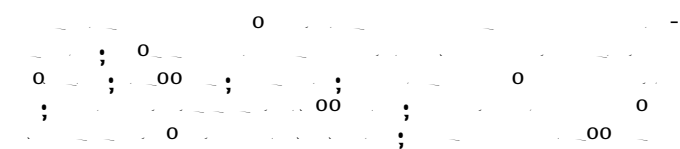
$$C(u, v) = \frac{1}{\theta} \left( 1 + \frac{(\theta - 1)(-u - v)}{(\theta - 1) - \theta uv} \right), \quad \theta \neq 0 \quad (7)$$

$$\varphi(t) = \frac{-t}{1 - t} \quad (8)$$

$$\varphi^{-1}(t) = \frac{t}{1 - t} \quad (9)$$

$$C(u, v) = \frac{(\theta - 1) - (\theta - 1)uv}{(\theta - 1) - \theta uv} \quad (10)$$

**Appendix B. Bayesian estimation of the joint distribution model**



$$\pi(\theta_1, \dots, \theta_n) = \pi(\theta) \prod_{i=1}^n \pi(\theta_i), \quad (11)$$

$$\mathbf{x}^{(i)} = (x^{(i)}_1, \dots, x^{(i)}_n) \quad (12)$$

$$\mathcal{L}(\mathbf{x}|\theta, \dots) = \prod_{i=1}^t \left( \binom{O_i}{x_i}; \dots, \binom{O_i}{x_i}; \theta \right) \prod_{i=1}^t \binom{O_i}{x_i}, \quad (1)$$

$$\begin{aligned} \mathcal{L} &= \sum_{\theta} \left( \binom{O_i}{x_i}; \dots, \binom{O_i}{x_i}; \theta \right) + \sum_{\theta} \\ &\quad \times \sum_{\theta} \binom{O_i}{x_i}. \end{aligned} \quad (3)$$

$$\begin{aligned} &\pi(\theta, \dots, \mathbf{x}) = \pi(\theta) + \sum_{i=1}^t \pi(x_i) \\ &+ \sum_{i=1}^t \left( \binom{O_i}{x_i}; \dots, \binom{O_i}{x_i}; \theta \right) \\ &+ \sum_{i=1}^t \sum_{\theta} \binom{O_i}{x_i}, \end{aligned} \quad (2)$$

$$\begin{aligned} &\mu = \rho, \\ &\lambda = \rho \left( \frac{1}{\rho} - 1 \right), \\ &\lambda + \mu = \rho. \end{aligned} \quad (C)$$

Appendix C. Backus averaging method

$$\begin{aligned} &\mu = \rho, \\ &\lambda = \rho \left( \frac{1}{\rho} - 1 \right), \\ &\lambda + \mu = \rho. \end{aligned} \quad (C)$$

$$\begin{aligned} &= \frac{\mu(\lambda + \mu)}{\lambda + \mu} + \frac{\lambda}{\lambda + \mu} \\ &= \frac{\mu}{\lambda + \mu} \\ &= \frac{\mu}{\lambda + \mu} \end{aligned} \quad (C)$$

Appendix D. Model selection in copula models using information criteria

$$\begin{aligned} &C = \left( \frac{1}{\rho}, - \right), \\ &C = \left( \hat{\theta} - \right), \end{aligned} \quad (C)$$

References

009 C o ; ( ) o  
o  
0 ;  
; C o 0 0 - ; o C o  
5 383-399 ; o // | 0 0 6/ ; 00903008  
0 7 ; o // ; o  
96 ; o // ? = ;  
o, 67 ( ) 7- 0 ; o // | 0 0 9/ 067 0 00 7  
o // 993 C ;  
o  
85-98 ; o // 003 ; o, 68  
C | 0 90/ 5 3 06  
o, 60 (5) 57- 73 ; o // | 0 90/ 3880  
008 ; o // | 0 0 9/ 007 006 5  
(7) 07 ; o // | 0 00 /978 8 36 88  
C ; o // | 0 0 7/C 97805 790 85  
C ; 983  
o, 8 665-676 ; o // | 0 90/ 97 ; o // o  
C | o, / -o | 8/6/665/3 00/665 o  
00 | 0/0 7/C 978 07 53 00 ; o // 53 ; o //  
; C 998  
o ; o // | 0 0 6/0098-300 (9 )900 -8  
006 ; C  
oo -C ; ; - a 7 ;  
o  
C - o, 005 o ; - a C o 05  
o  
o  
- a - o ; o o, o o  
0 7  
0 6 87-