Multivariate drought risk analysis over Weihe River: Comparison between parametric and non-parametric copula methods

Supplementary Materials

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Table S1. The p-values of AD test for Gamma distribution for SPI

Station ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
52986	0.426	0.451	0.804	0.897	0.961	0.999	0.972	0.937	0.983	0.999	0.858	0.219
52996	0.841	0.802	0.972	0.795	0.867	0.967	0.949	0.878	0.859	0.707	0.924	0.891
53738	0.026	0.912	0.957	0.974	0.981	0.986	0.964	0.853	0.778	0.949	0.524	0.000
53817	0.613	0.870	0.968	0.994	0.523	0.708	0.712	0.985	0.959	0.990	0.522	0.424
53821	0.358	0.442	0.968	0.686	0.949	0.972	0.957	0.998	0.937	0.971	0.354	0.003
53845	0.244	0.835	1.000	0.804	0.744	0.901	0.755	0.974	0.894	0.466	0.710	0.015
53903	0.847	0.621	0.978	0.824	0.652	0.995	0.994	0.953	0.911	0.988	0.374	0.219
53915	0.311	0.850	0.928	0.914	0.450	0.885	0.999	0.983	0.830	0.976	0.589	0.201
53923	0.386	0.700	0.955	0.549	0.979	0.876	0.999	0.927	0.993	0.806	0.603	0.367
53929	0.518	0.797	0.996	0.926	0.952	0.989	0.983	0.997	0.952	0.882	0.660	0.370
53942	0.493	0.527	0.910	0.990	0.971	0.984	0.601	0.905	0.850	0.528	0.512	0.086
56093	0.977	0.980	0.852	0.978	0.976	0.881	0.771	0.995	0.994	0.873	0.877	0.000
57034	0.258	0.485	0.981	0.982	0.996	0.980	0.905	0.880	0.987	0.783	0.970	0.003
57037	0.529	0.517	0.889	0.900	0.876	0.733	0.995	0.996	0.745	0.978	0.905	0.000
57046	0.749	0.970	0.673	0.841	0.993	0.986	0.999	0.911	0.996	0.965	0.967	0.880
57134	0.443	0.980	0.826	0.712	0.848	0.991	0.848	0.993	0.986	0.963	0.772	0.868
57144	0.471	0.880	0.899	0.902	0.999	0.666	0.936	0.995	0.999	0.994	0.983	0.165
57143	0.410	0.922	0.843	0.608	0.940	0.921	0.997	0.930	0.993	0.758	0.501	0.302

Table S2. The p-values of AD test for GEV distribution for SPEI

Station ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
52986	0.984	0.827	0.911	0.909	0.978	0.998	0.950	0.892	0.953	0.998	0.975	0.928
52996	0.952	0.734	0.807	0.919	0.931	0.951	0.930	0.791	0.907	0.730	0.994	0.793
53738	0.960	0.981	0.487	0.935	0.831	0.928	0.908	0.863	0.983	0.994	0.943	0.733
53817	0.636	0.986	1.000	0.909	0.790	0.733	0.878	0.985	0.924	0.995	0.857	0.715
53821	0.796	0.928	0.909	0.945	0.948	0.971	0.974	0.998	0.924	0.999	0.958	0.950
53845	0.992	0.949	0.980	0.969	0.842	0.973	0.734	0.988	0.900	0.628	0.954	0.935
53903	0.991	0.940	0.971	0.872	0.941	0.864	0.979	0.953	0.993	0.990	0.997	0.998
53915	1.000	0.988	0.985	0.969	0.457	0.976	0.964	0.775	0.829	0.974	0.997	0.835
53923	0.999	0.654	0.966	0.806	0.999	0.918	0.961	0.946	0.995	0.942	0.983	0.977
53929	0.960	0.863	0.971	0.804	0.967	0.992	0.918	0.987	0.774	0.873	0.995	0.997
53942	0.975	0.980	0.978	0.995	0.988	0.851	0.684	0.978	0.701	0.746	0.948	1.000
56093	0.843	0.981	0.998	0.905	0.999	0.492	0.842	1.000	0.995	0.949	0.969	0.999
57034	0.998	0.998	0.942	0.982	0.982	0.849	0.695	0.989	0.908	0.952	0.972	0.912
57037	0.995	0.981	0.994	0.938	0.925	0.835	1.000	0.997	0.833	0.992	0.984	0.856
57046	0.929	0.988	0.964	0.902	0.991	0.923	0.999	0.931	0.990	0.954	0.984	0.996
57134	0.819	0.891	0.902	0.869	0.798	0.998	0.868	0.963	0.990	0.991	0.650	0.973
57144	0.996	0.982	0.976	0.961	0.740	0.781	0.882	0.987	0.999	0.974	0.950	0.919
57143	0.900	0.998	0.932	0.877	0.981	0.963	0.980	0.982	0.997	0.907	0.673	0.990

Table S3. Performances of the best parametric copula and nonparametric copula for 3-month SPI and SPEI at each station

		Parametric copula			Nonparametric copula		
Station ID	Option	P-value (KS)	RMSE	AIC	P-value (KS)	RMSE	AIC
52986	Joe	0.9880	0.0252	-307.04	0.9891	0.0206	-295.94
52996	Gumbel	0.7443	0.0313	-275.22	0.9042	0.0319	-255.75
53738	Joe	0.9999	0.0271	-308.36	0.9999	0.0260	-291.63
53817	Joe	0.9886	0.0280	-298.36	0.9204	0.0369	-262.13
53821	Gumbel	1.0000	0.0263	-325.50	0.9383	0.0273	-302.00
53845	Gaussian	0.7998	0.0271	-315.48	0.9308	0.0279	-298.62
53903	Gaussian	0.9896	0.0321	-286.98	0.9892	0.0310	-275.65
53915	Gumbel	0.9885	0.0239	-311.56	0.9893	0.0253	-280.24
53923	Gumbel	0.9999	0.0200	-334.34	0.9999	0.0227	-307.73
53929	Gumbel	0.9924	0.0193	-345.54	0.7982	0.0268	-311.79
53942	Gumbel	0.9931	0.0289	-309.79	0.9327	0.0314	-288.28
56093	Gaussian	0.9999	0.0259	-290.16	0.9998	0.0256	-275.71
57034	Gaussian	0.9916	0.0266	-317.28	0.9921	0.0225	-313.31
57037	Gumbel	0.9917	0.0307	-304.45	0.9929	0.0307	-288.45
57046	Gumbel	0.9316	0.0391	-283.24	0.9317	0.0356	-272.25
57134	Joe	0.9424	0.0253	-336.22	0.9937	0.0278	-311.83
57144	Gaussian	0.7806	0.0279	-305.81	0.7832	0.0286	-289.67
57143	Frank	0.9943	0.0269	-330.65	0.9940	0.0301	-307.08