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LAMPIRAN

Lampiran 1. Data Curah Hujan Ekstrem di Kota Makassar

Bulan/Tahun	MAKASSAR	BAROMBONG	PAOTERE
Mar-18	617	362	574
Apr-18	193	54	167
May-18	73	30	32
Jun-18	81	33	121
Jul-18	39	14	49
Aug-18	19	0	1
Sep-18	1	0	1
Oct-18	47	3	12
Nov-18	184	34	156
Dec-18	787	398	858
Jan-19	565	346	637
Feb-19	210	151	236
Mar-19	311	139	445
Apr-19	247	79	346
May-19	51	10	60
Jun-19	54	29	61
Jul-19	4	0	2
Aug-19	0	1	0
Sep-19	0	0	0
Oct-19	3	2	0
Nov-19	39	7	78
Dec-19	304	183	281
Jan-20	474	386	572
Feb-20	490	734	539
Mar-20	259	316	264
Apr-20	139	87	100
[illegible]	329	154	186

Lampiran 1. Data Curah Hujan Ekstrem di Kota Makassar (*lanjutan*)

Bulan/Tahun	MAKASSAR	BAROMBONG	PAOTERE
Jun-20	48	76	73
Jul-20	22	14	9
Aug-20	17	10	16
Sep-20	31	46	23
Oct-20	38	54	54
Nov-20	202	150	249
Dec-20	915	1059	924
Jan-21	1050	962	1121
Feb-21	354	417	434
Mar-21	649	457	682
Apr-21	379	346	435
May-21	142	119	66
Jun-21	117	57	77
Jul-21	83	103	42
Aug-21	97	96	64
Sep-21	125	191	115
Oct-21	229	122	110
Nov-21	530	397	331
Dec-21	982	496	965
Jan-22	657	528	656
Feb-22	690	365	660
Mar-22	373	134	238
Apr-22	128	21	64
May-22	377	292	314
Jun-22	143	63	107
Jul-22	16	3	7
Aug-22	59	27	42
Sep-22	48	104	47
	390	294	390
	344	289	343

Lampiran 2. Data Transformasi dari Distribusi GEV ke Margin Copula (u)

No	Makassar	Barombong	Paotere
1	0.816982	0.742948	0.783758
2	0.116796	0.095298	0.190633
3	0.310437	0.09787	0.279699
4	0.883854	0.770894	0.87263
5	0.532949	0.397645	0.706483
6	0.076475	0.085257	0.051037
7	0.057617	0.038851	0.085098
8	0.734203	0.902091	0.782813
9	0.559049	0.699567	0.501901
10	0.068602	0.218946	0.074381
11	0.3453	0.425061	0.476559
12	0.936981	0.945086	0.912529
13	0.832652	0.807975	0.826612
14	0.18016	0.299204	0.082914
15	0.764386	0.770178	0.596645
16	0.926895	0.841961	0.891813
17	0.621717	0.672737	0.575195
18	0.229956	0.17987	0.154711
19	0.637029	0.675098	0.65996

Lampiran 3. *Output* Hasil Uji Anderson Darling

```
> #Uji Anderson Darling
> F1=F.GEV(BMCH2$Makassar, 216.3351759, 202.6673648,
0.3774592)
> A1=A2(sort(F.GEV(BMCH2$Makassar, 216.3351759, 202.6673648,
0.3774592)))
Warning message:
> AD1=A2_GOFlaio(BMCH2$Makassar, dist="GEV")
> print(AD1)
       A2     p(A2)
0.4007158 0.8215362
> F2=F.GEV(BMCH2$Barombong, 114.7480151, 129.0700046,
0.6741398)
> A2=A2(sort(F.GEV(BMCH2$Barombong, 114.7480151, 129.0700046,
0.6741398)))
> AD2=A2_GOFlaio(BMCH2$Barombong, dist="GEV")
> print(AD2)
       A2     p(A2)
0.4953790 0.9149528
> F3=F.GEV(BMCH2$Paotere, 185.7939176, 167.4075077,
0.8040311)
> A3=A2(sort(F.GEV(BMCH2$Paotere,185.7939176, 167.4075077,
0.8040311)))
> AD3=A2_GOFlaio(BMCH2$Paotere, dist="GEV")
> print(AD3)
       A2     p(A2)
0.6087935 0.9646048
```

Lampiran 4. *Output* Hasil Estimasi Parameter Distribusi GEV

```
> #Estimasi Parameter dengan GEV
> BMCH2<-read.table("D:/Tugas Akhir/BMtraining.txt",
header=T)
> View(BMCH2)
> fit1<-fevd(BMCH2$Makassar, BMCH2, units="deg C")
> fit1
fevd(x = BMCH2$Makassar, data = BMCH2, units = "deg C")
[1] "Estimation Method used: MLE"
 Negative Log-Likelihood Value:  126.6558
 Estimated parameters:
   location       scale       shape
216.3351759 202.6673648   0.3774592
 Standard Error Estimates:
  location      scale      shape
70.2598664 62.6669834  0.4717332
 Estimated parameter covariance matrix.
           location      scale       shape
location 4936.44883 3584.27629 -20.7400711
scale    3584.27629 3927.15081 -13.5430113
shape     -20.74007  -13.54301   0.2225322
 AIC = 259.3115
 BIC = 261.9826
> fit2<-fevd(BMCH2$Barombong, BMCH2, units="deg C")
> fit2
fevd(x = BMCH2$Barombong, data = BMCH2, units = "deg C")
[1] "Estimation Method used: MLE"
 Negative Log-Likelihood Value:  122.0078
 Estimated parameters:
   location       scale       shape
114.7480151 129.0700046   0.6741398
 Standard Error Estimates:
  location      scale      shape
42.6267893 43.7745104  0.4458544
 Estimated parameter covariance matrix.
           location       scale       shape
location 1817.04317 1593.778724 -10.4515665
scale    1593.77872 1916.207763  -5.5368450
shape     -10.45157   -5.536845   0.1987862
 AIC = 250.0156
 BIC = 252.6868
```

Lampiran 4. *Output* Hasil Estimasi Parameter Distribusi GEV (*lanjutan*)

```
> fit3<-fevd(BMCH2$Paotere, BMCH2, units="deg C")
> fit3
fevd(x = BMCH2$Paotere, data = BMCH2, units = "deg C")
[1] "Estimation Method used: MLE"
 Negative Log-Likelihood Value:  125.5766
 Estimated parameters:
   location       scale       shape
185.7939176 167.4075077   0.8040311
 Standard Error Estimates:
  location      scale      shape
66.8434599 71.6864271  0.6917059
 Estimated parameter covariance matrix.
           location      scale      shape
location 4468.04813 4285.23658 -30.110549
scale    4285.23658 5138.94383 -18.480628
shape     -30.11055  -18.48063   0.478457
 AIC = 257.1532
 BIC = 259.8243
```

Lampiran 5. *Output* Hasil Analisis Dependensi Spasial

```
> #Perhitungan koefisien ekstermal
> loc <- cbind(c(-5.149166, -5.208528, -5.11375),
+              c(119.452222,119.393528,119.419833))
> loc <- as.matrix(loc)
> colnames(loc)<-c("lat","lon")
> print(loc)
           lat      lon
[1,] -5.149166 119.4522
[2,] -5.208528 119.3935
[3,] -5.113750 119.4198
> par(mar = c(1, 1, 1, 1))
> fitextcoeff(U,loc,estim="Smith")
$ext.coeff
       distance ext.coeff    std.err
[1,] 0.08347953  1.232204 0.10081350
[2,] 0.04799313  1.246108 0.06024663
[3,] 0.09836067  1.362436 0.10609512
$loess
Call:
loess(formula = ext.coeff ~ dist)
Number of Observations: 3
Equivalent Number of Parameters: 3
Residual Standard Error: NaN
```

Lampiran 6. *Output* Hasil Estimasi Parameter Copula Gaussian

```
> print(C9)
           Copula: gaussian
         Deviance: -42.10909
              AIC: -26.10909
Covariance Family: Whittle-Matern
Estimates
  Marginal Parameters:
    Location Parameters:
locCoeff1  locCoeff2
   2.3503     0.3595
       Scale Parameters:
scaleCoeff1  scaleCoeff2
     0.9238       0.1036
       Shape Parameters:
shapeCoeff1
    -0.8175
  Dependence Parameters:
nugget   range  smooth
0.0000  0.1421  1.0000
Optimization Information
  Convergence: successful
  Function Evaluations: 23
> p1=predict(C9,loc,ret.per = 2)
> p1
        lat      lon       loc     scale       shape        Q2
1 -5.149166 119.4522 0.4989974 0.3904059 -0.8174707 0.6226402
2 -5.208528 119.3935 0.4776546 0.3842564 -0.8174707 0.5993498
3 -5.113750 119.4198 0.5117308 0.3940747 -0.8174707 0.6365354
```