

PEST RUN RECORD: CASE Jagueyes ver. 4

PEST run mode:-

Parameter estimation mode

Case dimensions:-

Number of parameters	:	4
Number of adjustable parameters	:	4
Number of parameter groups	:	1
Number of observations	:	58
Number of prior estimates	:	0

Model command line(s):-

runner.bat

Jacobian command line:-

na

Model interface files:-

Templates:
 inputs.tpl
 for model input files:
 inputs.txt

(Parameter values written using single precision protocol.)
 (Decimal point always included.)

Instruction files:
 height.ins
 for reading model output files:
 sample.tss

PEST-to-model message file:-

na

Derivatives calculation:-

Param group (central)	Increment type	Increment	Increment low bound	Forward or central	Multiplier (central)	Method
inputs	relative	1.0000E-02	none	switch	2.000	parabolic

Parameter definitions:-

Name	Trans-formation	Change limit	Initial value	Lower bound	Upper bound
gamma1	none	relative	18.0000	10.0000	50.0000
yield1	none	relative	0.50000	0.10000	5.00000
visco1	none	relative	2.50000	1.60000	50.0000

angle1 none Annex7B.txt relative 5.00000 1.00000 35.0000

Name	Group	Scale	Offset	Model command number
gamma1	inputs	1.00000	0.00000	1
yield1	inputs	1.00000	0.00000	1
visco1	inputs	1.00000	0.00000	1
angle1	inputs	1.00000	0.00000	1

Prior information:-

No prior information supplied

Observations:-

Observation name	observation	Weight	Group
obs1	0.00000	1.000	obsgroup
obs2	0.00000	0.8000	obsgroup
obs3	0.00000	0.2000	obsgroup
obs4	3.07000	0.8000	obsgroup
obs5	3.44000	0.8000	obsgroup
obs6	0.240000	0.6000	obsgroup
obs7	0.00000	0.8000	obsgroup
obs8	0.00000	1.000	obsgroup
obs9	10.5500	1.000	obsgroup
obs10	14.7900	1.000	obsgroup
obs11	11.4500	1.000	obsgroup
obs12	7.54000	1.000	obsgroup
obs13	3.73000	1.000	obsgroup
obs14	4.00000	1.000	obsgroup
obs15	3.40000	0.8000	obsgroup
obs16	1.53000	0.4000	obsgroup
obs17	10.9200	1.000	obsgroup
obs18	13.6900	1.000	obsgroup
obs19	10.7600	1.000	obsgroup
obs20	9.30000	1.000	obsgroup
obs21	9.73000	1.000	obsgroup
obs22	5.37000	1.000	obsgroup
obs23	2.91000	0.2000	obsgroup
obs24	1.61000	0.4000	obsgroup
obs25	18.4400	1.000	obsgroup
obs26	15.0000	1.000	obsgroup
obs27	10.9900	1.000	obsgroup
obs28	7.59000	1.000	obsgroup
obs29	9.19000	1.000	obsgroup
obs30	4.75000	1.000	obsgroup
obs31	3.25000	0.9000	obsgroup
obs32	3.58000	0.8000	obsgroup
obs33	2.00000E-02	0.2000	obsgroup
obs34	0.00000	1.000	obsgroup
obs35	19.1600	1.000	obsgroup
obs36	15.8300	1.000	obsgroup
obs37	4.36000	1.000	obsgroup
obs38	5.90000	0.9000	obsgroup
obs39	8.30000	0.8000	obsgroup
obs40	4.45000	0.8000	obsgroup
obs41	3.62000	0.8000	obsgroup
obs42	2.33000	0.6000	obsgroup
obs43	0.600000	0.3000	obsgroup
obs44	10.4600	0.3000	obsgroup
obs45	10.5800	0.8000	obsgroup
obs46	6.82000	1.000	obsgroup
obs47	6.89000	0.9000	obsgroup
obs48	7.94000	0.4000	obsgroup
obs49	3.35000	0.8000	obsgroup
obs50	0.240000	0.8000	obsgroup

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obs51	0.160000	0.8000	obsgroup
obs52	0.000000	1.000	obsgroup
obs53	0.000000	1.000	obsgroup
obs54	1.820000	0.4000	obsgroup
obs55	6.940000	0.3000	obsgroup
obs56	6.590000	1.000	obsgroup
obs57	4.310000	0.2000	obsgroup
obs58	1.270000	1.000	obsgroup

Control settings:-

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Initial lambda : 5.0000
Lambda adjustment factor : 2.0000
Sufficient new/old phi ratio per optimisation iteration : 0.30000
Limiting relative phi reduction between lambdas : 3.00000E-02
Maximum trial lambdas per iteration : 10

Perform Broyden's update of Jacobian matrix : no

Maximum factor parameter change (factor-limited changes) : na
Maximum relative parameter change (relative-limited changes) : 3.0000
Fraction of initial parameter values used in computing
change limit for near-zero parameters : 1.00000E-03
Allow bending of parameter upgrade vector : no
Allow parameters to stick to their bounds : no

Relative phi reduction below which to begin use of
central derivatives : 0.10000
Iteration at which to first consider derivatives switch : 1

Relative phi reduction indicating convergence : 0.10000E-01
Number of phi values required within this range : 3
Maximum number of consecutive failures to lower phi : 3
Minimal relative parameter change indicating convergence : 0.10000E-01
Number of consecutive iterations with minimal param change : 3
Maximum number of optimisation iterations : 30

Attempt automatic user intervention : no

Attempt reuse of parameter sensitivities : no

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OPTIMISATION RECORD

INITIAL CONDITIONS:

Sum of squared weighted residuals (ie phi) = 5.09000E+62

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Current parameter values
gamma1 18.0000
yield1 0.50000
visco1 2.50000
angle1 5.00000

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OPTIMISATION ITERATION NO. : 1
Model calls so far : 1
Starting phi for this iteration: 5.09000E+62

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Lambda = 5.0000 ----->
Phi = 3.13000E+62 ( 0.615 of starting phi)

Lambda = 2.5000 ----->
Phi = 5.73000E+62 ( 1.126 times starting phi)

Lambda = 10.000 ----->

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Phi = 3.77000E+62 (0.741 of starting phi)

No more lambdas: phi rising
Lowest phi this iteration: 3.13000E+62

Current parameter values		Previous parameter values	
gamma1	18.0303	gamma1	18.0000
yield1	0.50500	yield1	0.50000
visco1	2.50000	visco1	2.50000
angle1	5.00000	angle1	5.00000

Maximum relative change: 1.0000E-02 ["yield1"]

OPTIMISATION ITERATION NO. : 2
Model calls so far : 8
Starting phi for this iteration: 3.13000E+62

Lambda = 5.0000 ----->
Phi = 759.13 (0.000 of starting phi)

No more lambdas: phi is less than 0.3000 of starting phi
Lowest phi this iteration: 759.13

Current parameter values		Previous parameter values	
gamma1	18.0303	gamma1	18.0303
yield1	0.50500	yield1	0.50500
visco1	2.50000	visco1	2.50000
angle1	5.05000	angle1	5.00000

Maximum relative change: 1.0000E-02 ["angle1"]

OPTIMISATION ITERATION NO. : 3
Model calls so far : 13
Starting phi for this iteration: 759.13
Phi = 759.13 (1.000 times starting phi)
Phi = 759.13 (1.000 times starting phi)

No more lambdas: relative phi reduction between lambdas less than 0.0300
Lowest phi this iteration: 759.13
Relative phi reduction between optimisation iterations less than 0.1000
Switch to central derivatives calculation
(restart from best parameters so far - these achieved at iteration 2)

Current parameter values	
gamma1	18.0303
yield1	0.50500
visco1	2.50000
angle1	5.05000

OPTIMISATION ITERATION NO. : 4
Model calls so far : 17
Starting phi for this iteration: 759.13

Lambda = 2.5000 ----->
Phi = 4.29000E+62 (***** times starting phi)

Lambda = 1.2500 ----->
Phi = 5.09000E+62 (***** times starting phi)

Lambda = 5.0000 ----->
Phi = 5.09000E+62 (***** times starting phi)

No more lambdas: phi rising
Lowest phi this iteration: 4.29000E+62

Current parameter values		Previous parameter values	
gamma1	18.0303	gamma1	18.0303

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yield1	0.50500	yield1	0.50500
visco1	2.50000	visco1	2.50000
angle1	5.17563	angle1	5.05000

Maximum relative change: 2.4877E-02 ["angle1"]

OPTIMISATION ITERATION NO. : 5
 Model calls so far : 28
 Starting phi for this iteration: 4.29000E+62

Lambda = 2.5000 ----->
 Phi = 1.79400E+63 (4.182 times starting phi)

Lambda = 1.2500 ----->
 Phi = 1.79400E+63 (4.182 times starting phi)

No more lambdas: relative phi reduction between lambdas less than 0.0300
 Lowest phi this iteration: 1.79400E+63

Current parameter values		Previous parameter values	
gamma1	10.0000	gamma1	18.0303
yield1	0.50500	yield1	0.50500
visco1	2.50000	visco1	2.50000
angle1	5.17563	angle1	5.17563

Maximum relative change: 0.4454 ["gamma1"]

Optimisation complete: 3 optimisation iterations have elapsed since lowest
 phi was achieved.
 Total model calls: 38

The model has been run one final time using best parameters.
 Thus all model input files contain best parameter values, and model
 output files contain model results based on these parameters.

OPTIMISATION RESULTS

Parameters ----->

Parameter	Estimated value	95% percent confidence limits	
		lower limit	upper limit
gamma1	18.0303	18.0303	18.0303
yield1	0.50500	0.50500	0.50500
visco1	2.50000	2.50000	2.50000
angle1	5.05000	5.05000	5.05000

Note: confidence limits provide only an indication of parameter uncertainty.
 They rely on a linearity assumption which may not extend as far in
 parameter space as the confidence limits themselves - see PEST manual.

See file temp4.sen for parameter sensitivities.

Observations ----->

Observation Group	Measured value	Calculated value	Residual	weight
obs1	0.00000	7.01502	-7.01502	1.000
obs2	0.00000	7.08873	-7.08873	0.8000
obs3	0.00000	6.90570	-6.90570	0.2000
obs4	3.07000	6.42355	-3.35355	0.8000
obs5	3.44000	5.64368	-2.20368	0.8000

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obs6	0.240000	4.60846	-4.36846	0.6000
obs7	0.00000	3.38088	-3.38088	0.8000
obs8	0.00000	2.05201	-2.05201	1.000
obs9	10.5500	7.40487	3.14513	1.000
obs10	14.7900	7.43881	7.35119	1.000
obs11	11.4500	7.20717	4.24283	1.000
obs12	7.54000	6.68156	0.858440	1.000
obs13	3.73000	5.87457	-2.14457	1.000
obs14	4.00000	4.82191	-0.821910	1.000
obs15	3.40000	3.58905	-0.189050	0.8000
obs16	1.53000	2.27077	-0.740770	0.4000
obs17	10.9200	7.67073	3.24927	1.000
obs18	13.6900	7.66512	6.02488	1.000
obs19	10.7600	7.39244	3.36756	1.000
obs20	9.30000	6.83813	2.46187	1.000
obs21	9.73000	6.01166	3.71834	1.000
obs22	5.37000	4.94658	0.423420	1.000
obs23	2.91000	3.71220	-0.802200	0.2000
obs24	1.61000	2.39803	-0.788030	0.4000
obs25	18.4400	7.74800	10.6920	1.000
obs26	15.0000	7.69912	7.30088	1.000
obs27	10.9900	7.39353	3.59647	1.000
obs28	7.59000	6.82075	0.769250	1.000
obs29	9.19000	5.98600	3.20400	1.000
obs30	4.75000	4.92176	-0.171760	1.000
obs31	3.25000	3.69836	-0.448360	0.9000
obs32	3.58000	2.40182	1.17818	0.8000
obs33	2.000000E-02	1.14045	-1.12045	0.2000
obs34	0.00000	3.556430E-10	-3.556430E-10	1.000
obs35	19.1600	7.58704	11.5730	1.000
obs36	15.8300	7.49405	8.33595	1.000
obs37	4.36000	7.16092	-2.80092	1.000
obs38	5.90000	6.58099	-0.680990	0.9000
obs39	8.30000	5.75255	2.54745	0.8000

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obsgroup				
obs40	4.45000	4.70820	-0.258200	0.8000
obsgroup				
obs41	3.62000	3.51754	0.102460	0.8000
obsgroup				
obs42	2.33000	2.26984	6.016000E-02	0.6000
obsgroup				
obs43	0.600000	1.07738	-0.477380	0.3000
obsgroup				
obs44	10.4600	7.16150	3.29850	0.3000
obsgroup				
obs45	10.5800	7.03218	3.54782	0.8000
obsgroup				
obs46	6.82000	6.68315	0.136850	1.000
obsgroup				
obs47	6.89000	6.10563	0.784370	0.9000
obsgroup				
obs48	7.94000	5.29792	2.64208	0.4000
obsgroup				
obs49	3.35000	4.29434	-0.944340	0.8000
obsgroup				
obs50	0.240000	3.16288	-2.92288	0.8000
obsgroup				
obs51	0.160000	1.99621	-1.83621	0.8000
obsgroup				
obs52	0.00000	0.901370	-0.901370	1.000
obsgroup				
obs53	0.00000	6.48056	-6.48056	1.000
obsgroup				
obs54	1.82000	6.32850	-4.50850	0.4000
obsgroup				
obs55	6.94000	5.98077	0.959230	0.3000
obsgroup				
obs56	6.59000	5.41433	1.17567	1.000
obsgroup				
obs57	4.31000	4.64110	-0.331100	0.2000
obsgroup				
obs58	1.27000	3.69839	-2.42839	1.000
obsgroup				

See file temp4.res for more details of residuals in graph-ready format.

See file temp4.seo for composite observation sensitivities.

Objective function ----->

sum of squared weighted residuals (ie phi) = 759.1

Correlation coefficient ----->

correlation coefficient = 0.7843

Analysis of residuals ----->

All residuals:-

Number of residuals with non-zero weight	=	58
Mean value of non-zero weighted residuals	=	0.6900
Maximum weighted residual [observation "obs35"]	=	11.57
Minimum weighted residual [observation "obs1"]	=	-7.015
Standard variance of weighted residuals	=	14.06
Standard error of weighted residuals	=	3.749

Note: the above variance was obtained by dividing the objective function by the number of system degrees of freedom (ie. number of observations with non-zero weight plus number of prior information

Annex7B.txt

articles with non-zero weight minus the number of adjustable parameters.)
If the degrees of freedom is negative the divisor becomes
the number of observations with non-zero weight plus the number of
prior information items with non-zero weight.

Parameter covariance matrix ----->

	gamma1	yield1	visco1	angle1
gamma1	5.7127E-59	-4.9530E-75	-7.9209E-59	-6.3544E-93
yield1	-4.9530E-75	1.4440E-59	-4.9300E-59	-6.3819E-95
visco1	-7.9209E-59	-4.9300E-59	3.5389E-58	4.7612E-94
angle1	-6.3544E-93	-6.3819E-95	4.7612E-94	1.1228E-64

Parameter correlation coefficient matrix ----->

	gamma1	yield1	visco1	angle1
gamma1	1.000	-1.7245E-16	-0.5571	-7.9340E-32
yield1	-1.7245E-16	1.000	-0.6897	-1.5849E-33
visco1	-0.5571	-0.6897	1.000	2.3885E-33
angle1	-7.9340E-32	-1.5849E-33	2.3885E-33	1.000

Normalized eigenvectors of parameter covariance matrix ----->

	Vector_1	Vector_2	Vector_3	Vector_4
gamma1	2.6779E-34	-0.2959	0.9255	-0.2363
yield1	3.8991E-34	-0.9343	-0.3319	-0.1299
visco1	1.1291E-34	-0.1986	0.1823	0.9630
angle1	1.000	4.6597E-34	-1.3903E-34	5.1795E-36

Eigenvalues ----->

1.1228E-64	3.9601E-60	4.1524E-59	3.7997E-58
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