# Validation process forGUAINIA

## The epidemiology research group, EAFIT

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# Chapter 1. Extension number1

## 1.1. Basic information

The extension to be validated consists of the time series from the data1 to the 87. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

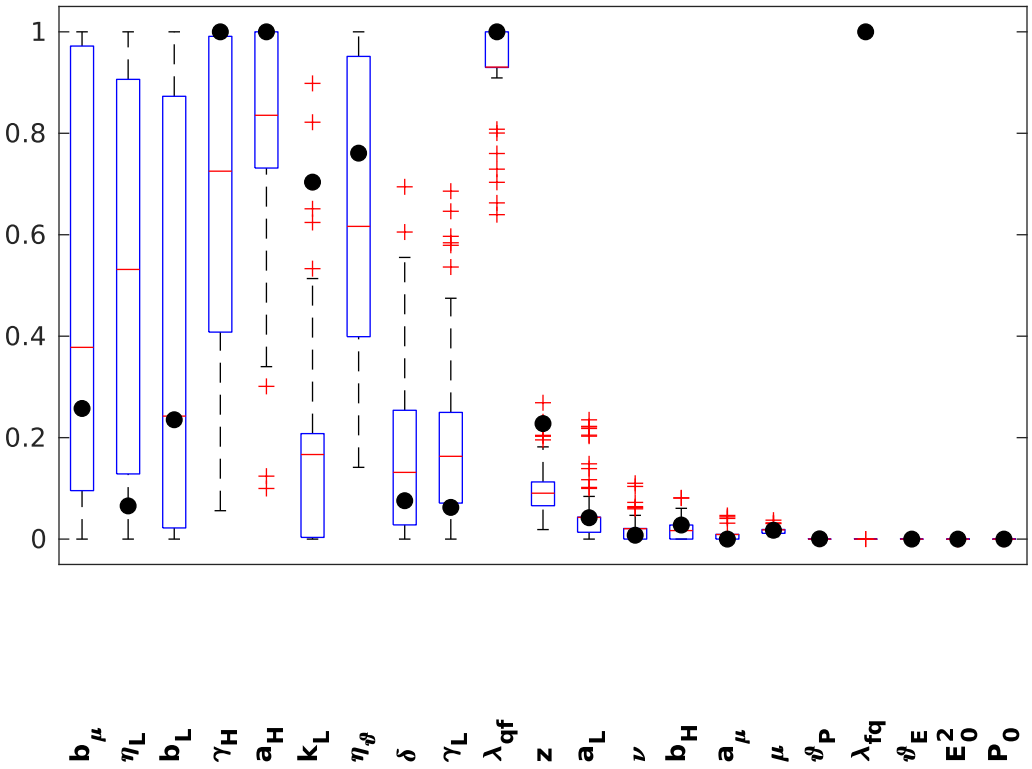
## 1.2. Estimated parameters with their intervals

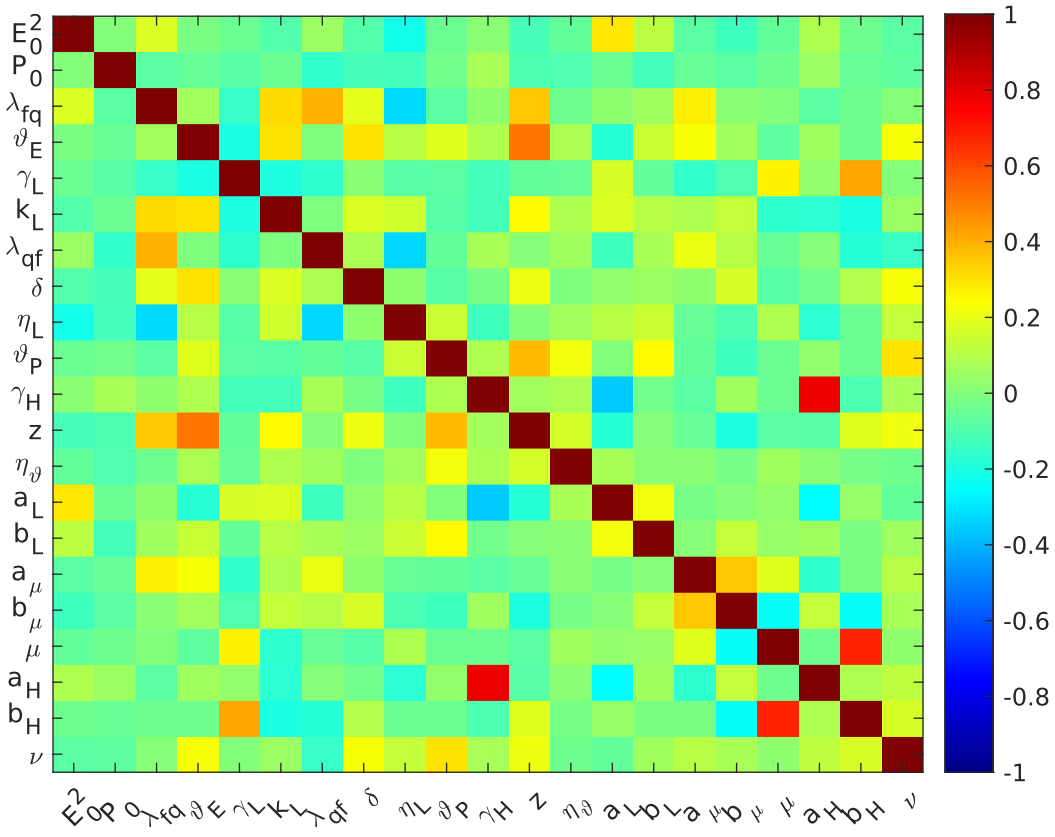
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

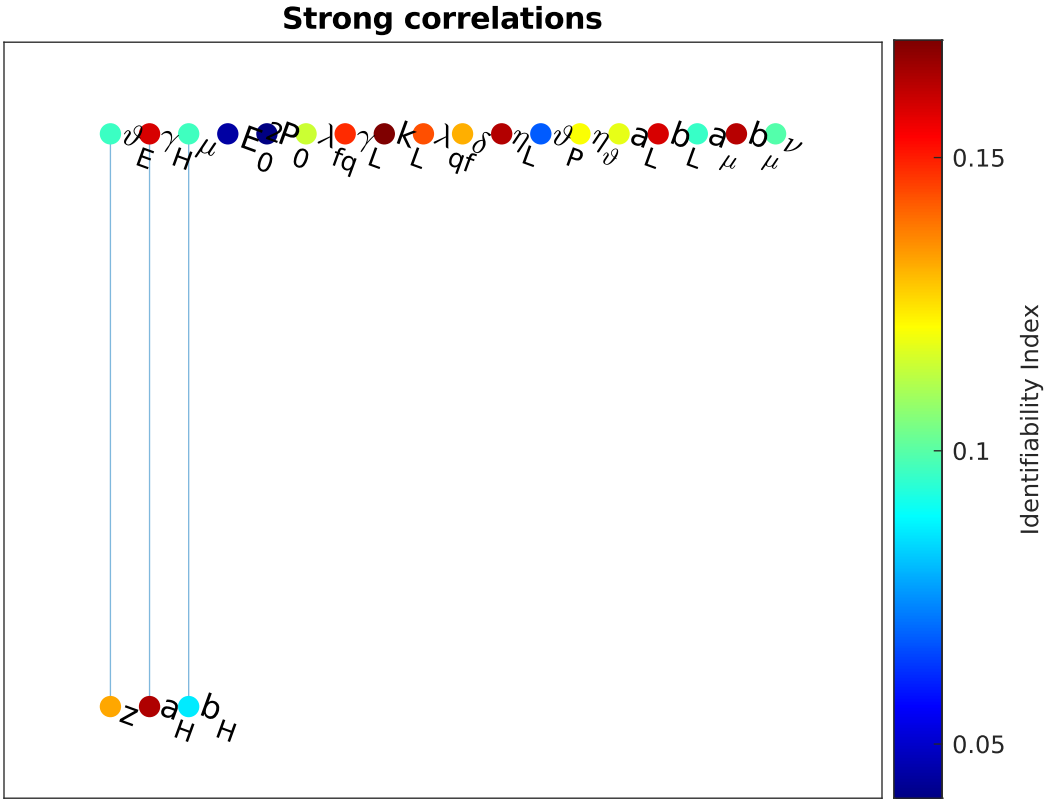
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **E^2_0** | '0' | '0' | '0' | '0' | '0.045' |
| **P_0** | '0' | '0' | '0' | '0' | '0.0408' |
| **\lambda_{fq}** | '0.9989' | '1' | '0' | '1' | '0.1147' |
| **\vartheta_E** | '0' | '0' | '0' | '0' | '0.0967' |
| **\gamma_L** | '0.0378' | '0.0723' | '0.165' | '0.0625' | '0.1481' |
| **k_L** | '1' | '9.55' | '2.5555' | '7.3334' | '0.17' |
| **\lambda_{qf}** | '0.9991' | '1' | '0.9297' | '1' | '0.1437' |
| **\delta** | '0.0113' | '0.0193' | '0.0202' | '0.0114' | '0.1314' |
| **\eta_L** | '0.041' | '0.8195' | '0.5316' | '0.0654' | '0.1632' |
| **\vartheta_P** | '0.0002' | '0.0009' | '0' | '0.0005' | '0.0683' |
| **\gamma_H** | '0.5865' | '1' | '0.7253' | '1' | '0.1586' |
| **z** | '6.6999' | '6.9865' | '2.7575' | '6.8314' | '0.1325' |
| **\eta_\vartheta** | '0.7428' | '1' | '0.6165' | '0.7608' | '0.1207' |
| **a_L** | '1' | '2.203' | '1.6078' | '1.5896' | '0.1183' |
| **b_L** | '2.9926' | '12.6049' | '4.3942' | '4.2939' | '0.1588' |
| **a_\mu** | '1' | '1.1599' | '1.1303' | '1' | '0.0959' |
| **b_\mu** | '4.4086' | '6.2155' | '6.2918' | '4.6053' | '0.1625' |
| **\mu** | '0.0146' | '0.0193' | '0.0182' | '0.0174' | '0.0969' |
| **a_H** | '11.2723' | '15' | '12.6862' | '15' | '0.1638' |
| **b_H** | '1.1627' | '2.1235' | '1.2398' | '1.3882' | '0.0862' |
| **\nu** | '0' | '7.478' | '10.4661' | '3.8027' | '0.0994' |

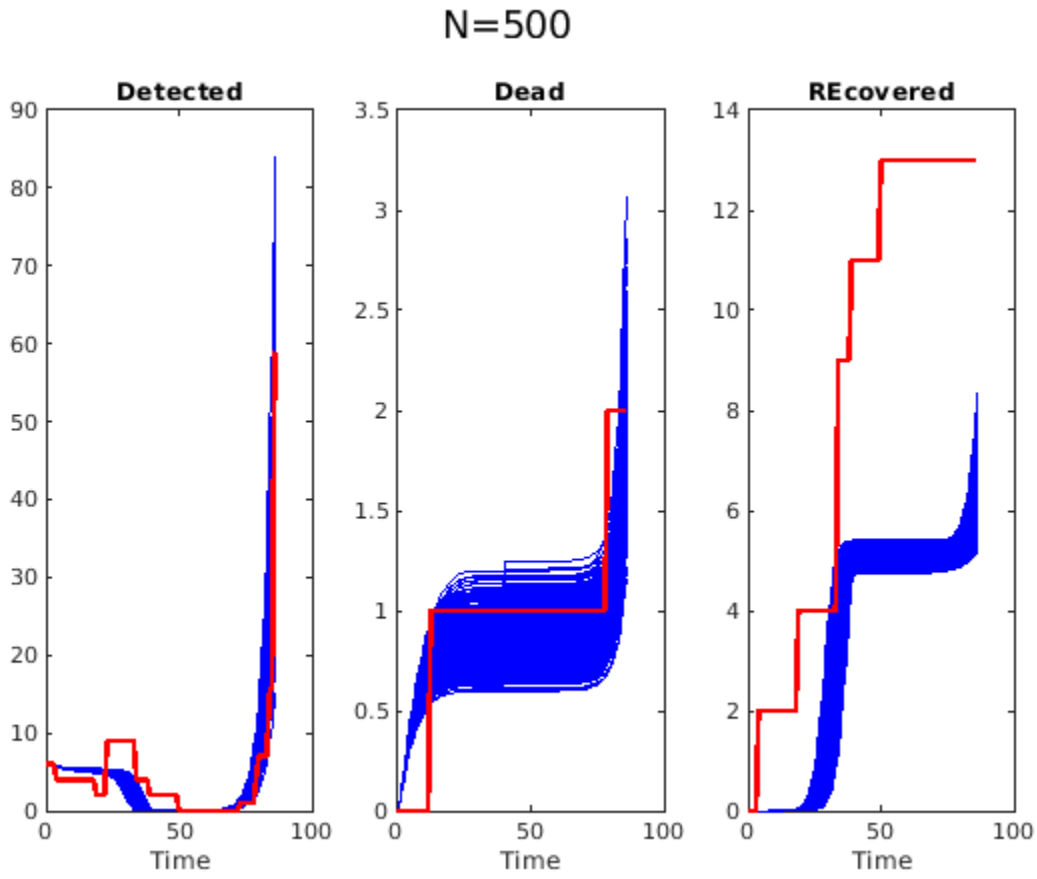
## 1.3. Identifiability analisys




$E_0^2$
$P_0$
$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
0.15
0.1
0.05
Identifiability Index

## 1.4. Uncertainty analisys



# Chapter 2. Extension number2

## 2.1. Basic information

The extension to be validated consists of the time series from the data87 to the 110. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

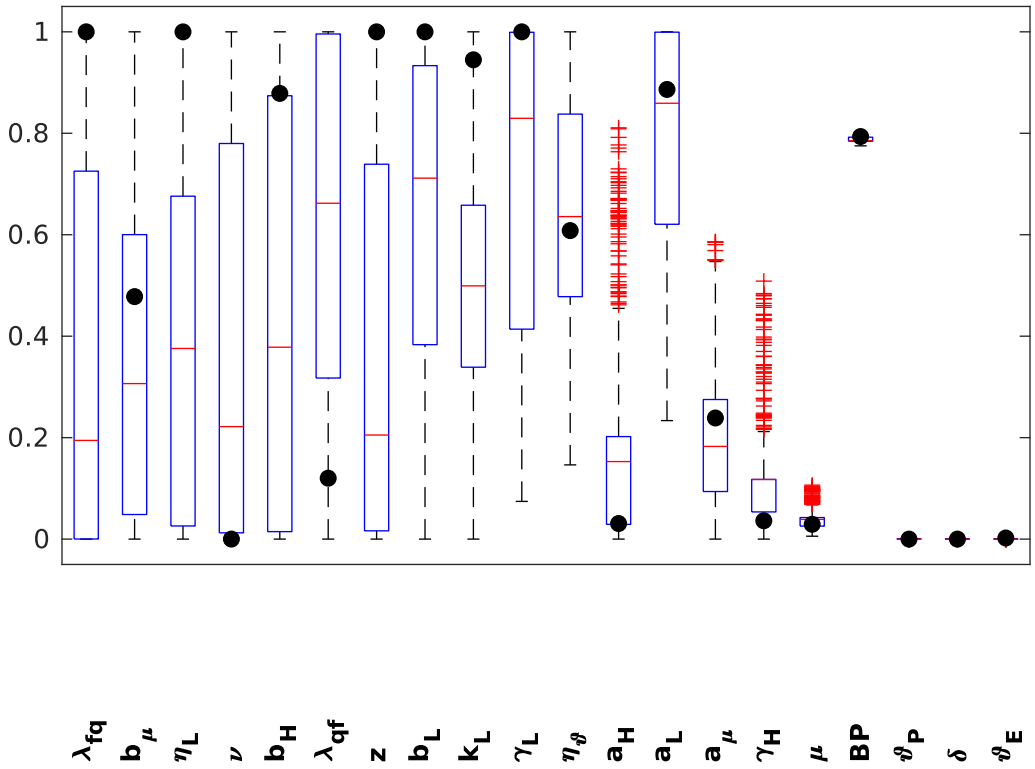
## 2.2. Estimated parameters with their intervals

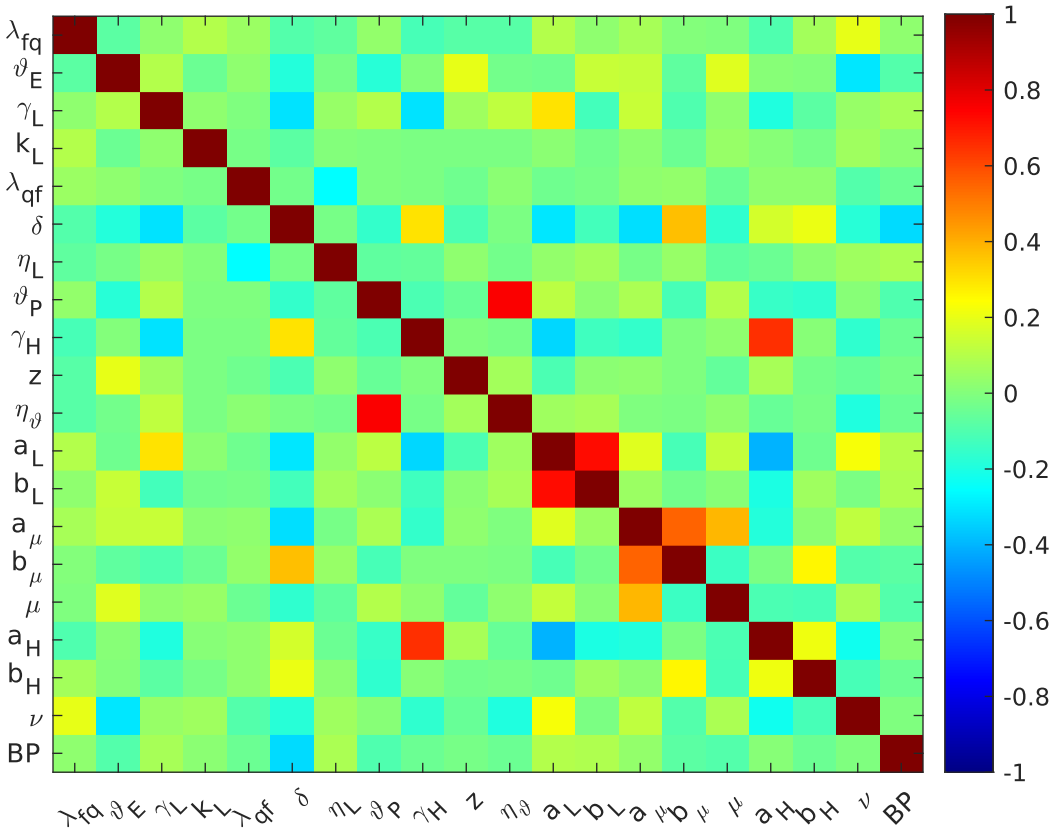
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

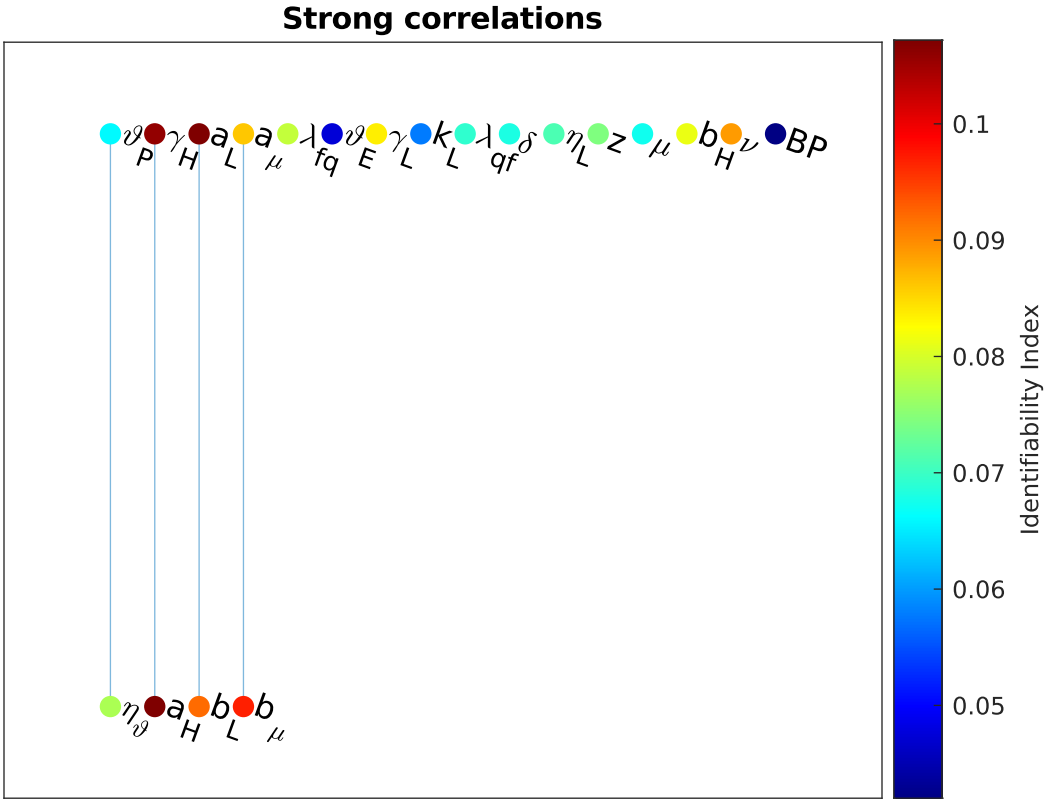
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.4401' | '1' | '0.1946' | '1' | '0.0789' |
| **\vartheta_E** | '0.0006' | '0.0031' | '0' | '0.0022' | '0.0475' |
| **\gamma_L** | '0.5085' | '1' | '0.8296' | '1' | '0.0837' |
| **k_L** | '1.9' | '9.514' | '5.4929' | '9.5039' | '0.0579' |
| **\lambda_{qf}** | '0.0531' | '0.2297' | '0.6621' | '0.1201' | '0.0695' |
| **\delta** | '0' | '0' | '0' | '0' | '0.0682' |
| **\eta_L** | '0.1356' | '1' | '0.3758' | '0.9999' | '0.0713' |
| **\vartheta_P** | '0' | '0' | '0' | '0' | '0.066' |
| **\gamma_H** | '0.0057' | '0.0703' | '0.1176' | '0.0362' | '0.1059' |
| **z** | '17.2306' | '30' | '6.154' | '29.9988' | '0.0744' |
| **\eta_\vartheta** | '0.5872' | '0.62' | '0.6357' | '0.6082' | '0.0772' |
| **a_L** | '11.2918' | '13.4168' | '13.0289' | '13.4101' | '0.1072' |
| **b_L** | '12.2378' | '15' | '10.9622' | '14.9997' | '0.092' |
| **a_\mu** | '3.5745' | '6.3601' | '3.5581' | '4.3424' | '0.0862' |
| **b_\mu** | '6.895' | '15' | '5.292' | '7.6924' | '0.0968' |
| **\mu** | '0.0212' | '0.0294' | '0.0388' | '0.0292' | '0.0673' |
| **a_H** | '1' | '10.2058' | '3.1398' | '1.4294' | '0.1072' |
| **b_H** | '1.5544' | '15' | '6.296' | '13.3009' | '0.0813' |
| **\nu** | '0' | '0.09' | '110.8989' | '0.04' | '0.089' |
| **BP** | '86.5345' | '87.728' | '86.6019' | '87.5' | '0.042' |

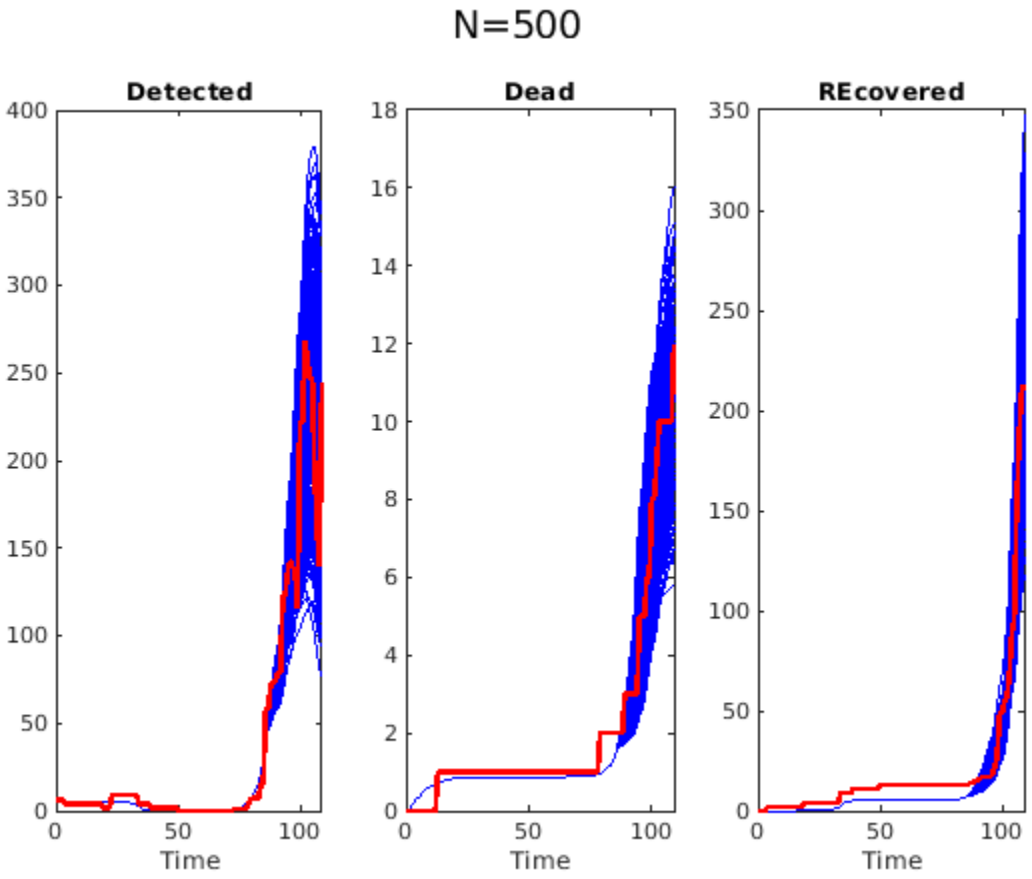
## 2.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.1
0.09
0.08
0.07
0.06
0.05

## 2.4. Uncertainty analisys



# Chapter 3. Extension number3

## 3.1. Basic information

The extension to be validated consists of the time series from the data110 to the 138. The status of the validation is: COMPLETED.

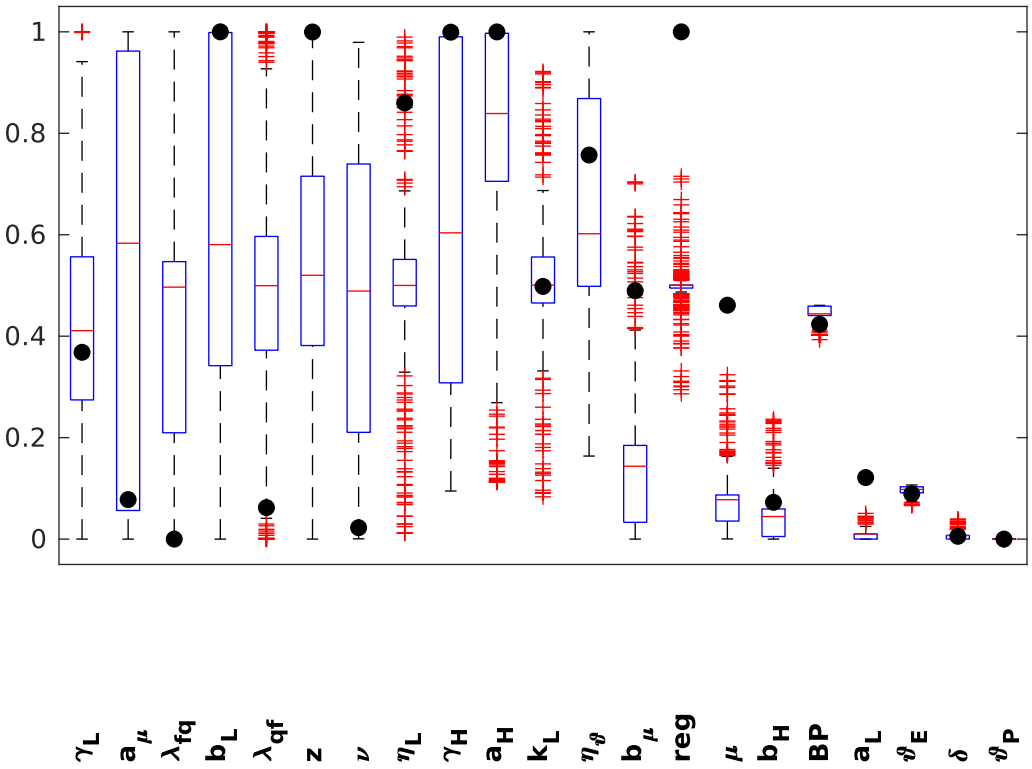
The number of estimations needed to perform the validation was1000.

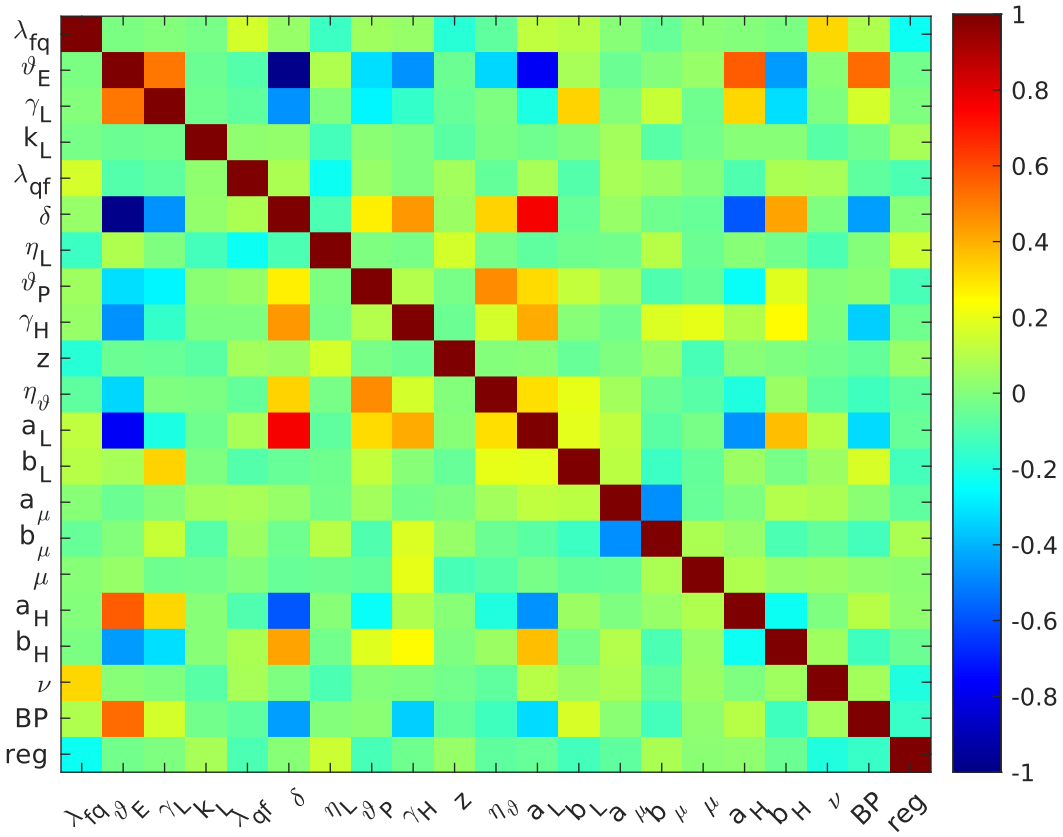
## 3.2. Estimated parameters with their intervals

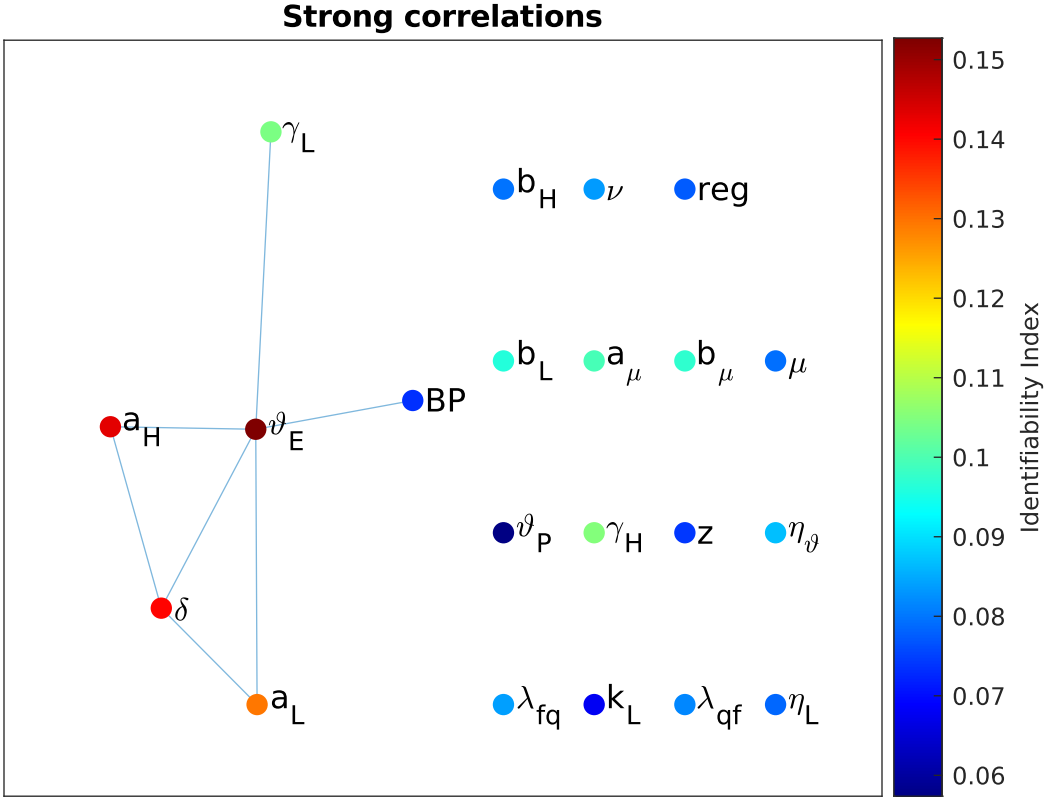
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.4564' | '0.537' | '0.4967' | '0' | '0.0842' |
| **\vartheta_E** | '0.0928' | '0.103' | '0.0979' | '0.0893' | '0.1527' |
| **\gamma_L** | '0.3789' | '0.443' | '0.411' | '0.3682' | '0.1045' |
| **k_L** | '5.1942' | '5.8184' | '5.5063' | '5.4831' | '0.068' |
| **\lambda_{qf}** | '0.4601' | '0.5389' | '0.4995' | '0.062' | '0.0816' |
| **\delta** | '0' | '0.0056' | '0.0011' | '0.0008' | '0.1403' |
| **\eta_L** | '0.4626' | '0.5375' | '0.5' | '0.8599' | '0.0786' |
| **\vartheta_P** | '0' | '0' | '0' | '0' | '0.0574' |
| **\gamma_H** | '0.558' | '0.6494' | '0.6037' | '0.9993' | '0.1052' |
| **z** | '14.4562' | '16.7469' | '15.6015' | '29.9904' | '0.0745' |
| **\eta_\vartheta** | '0.5704' | '0.6335' | '0.6019' | '0.7571' | '0.0871' |
| **a_L** | '1' | '1.6887' | '1.1448' | '2.6985' | '0.1292' |
| **b_L** | '8.4433' | '9.8111' | '9.1272' | '14.9997' | '0.0963' |
| **a_\mu** | '8.3486' | '9.9826' | '9.1656' | '2.0901' | '0.0995' |
| **b_\mu** | '2.3132' | '3.7117' | '3.0125' | '7.8564' | '0.0975' |
| **\mu** | '0.0352' | '0.1205' | '0.0778' | '0.4611' | '0.0796' |
| **a_H** | '11.8973' | '13.5282' | '12.7127' | '14.9977' | '0.1434' |
| **b_H** | '1.3233' | '1.9245' | '1.6239' | '2.0152' | '0.0801' |
| **\nu** | '222.9401' | '266.0108' | '244.4754' | '11.2379' | '0.0835' |
| **BP** | '109.525' | '109.7691' | '109.6471' | '108.5919' | '0.0737' |
| **reg** | '0.1164' | '0.1339' | '0.1251' | '0.25' | '0.0778' |

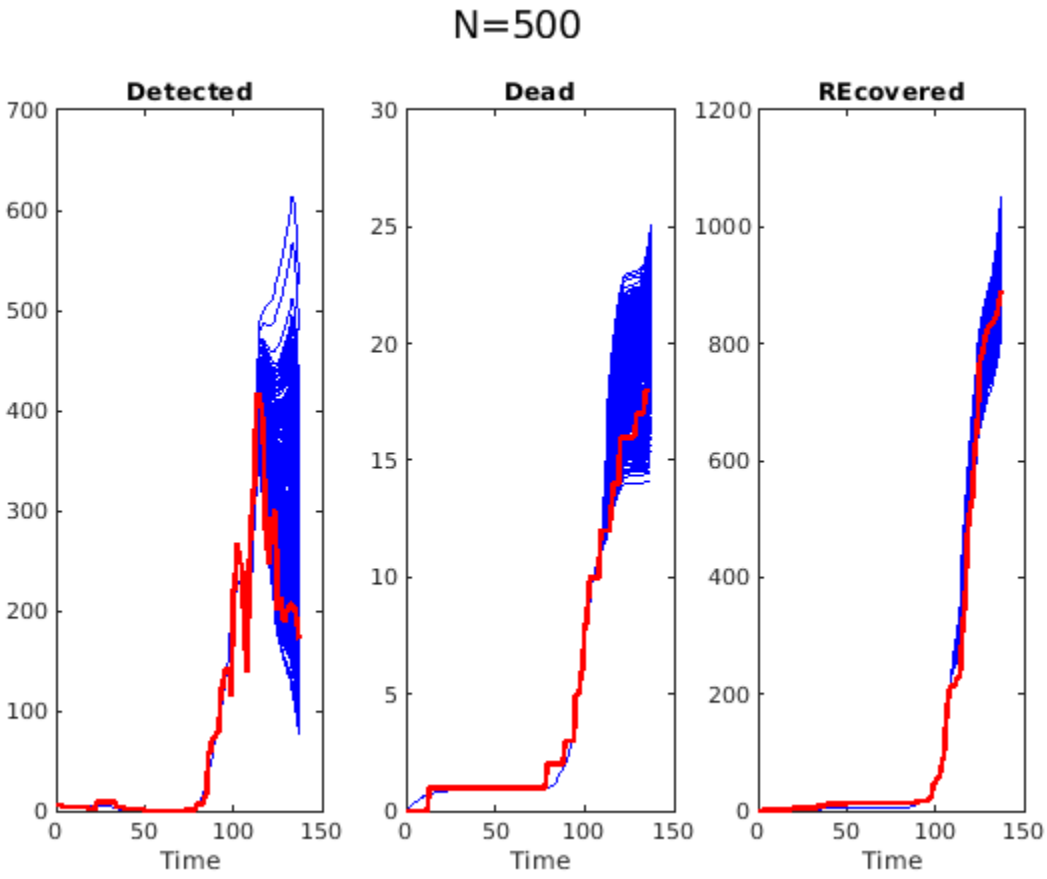
## 3.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
reg
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\gamma_L$
$b_H$
$\nu$
reg
$b_L$
$a_\mu$
$b_\mu$
$\mu$
BP
$a_H$
$\vartheta_E$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$\delta$
$a_L$
$\lambda_{fq}$
$k_L$
$\lambda_{qf}$
$\eta_L$
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
Identifiability Index

## 3.4. Uncertainty analisys



# Chapter 4. Extension number4

## 4.1. Basic information

The extension to be validated consists of the time series from the data138 to the 236. The status of the validation is: COMPLETED.

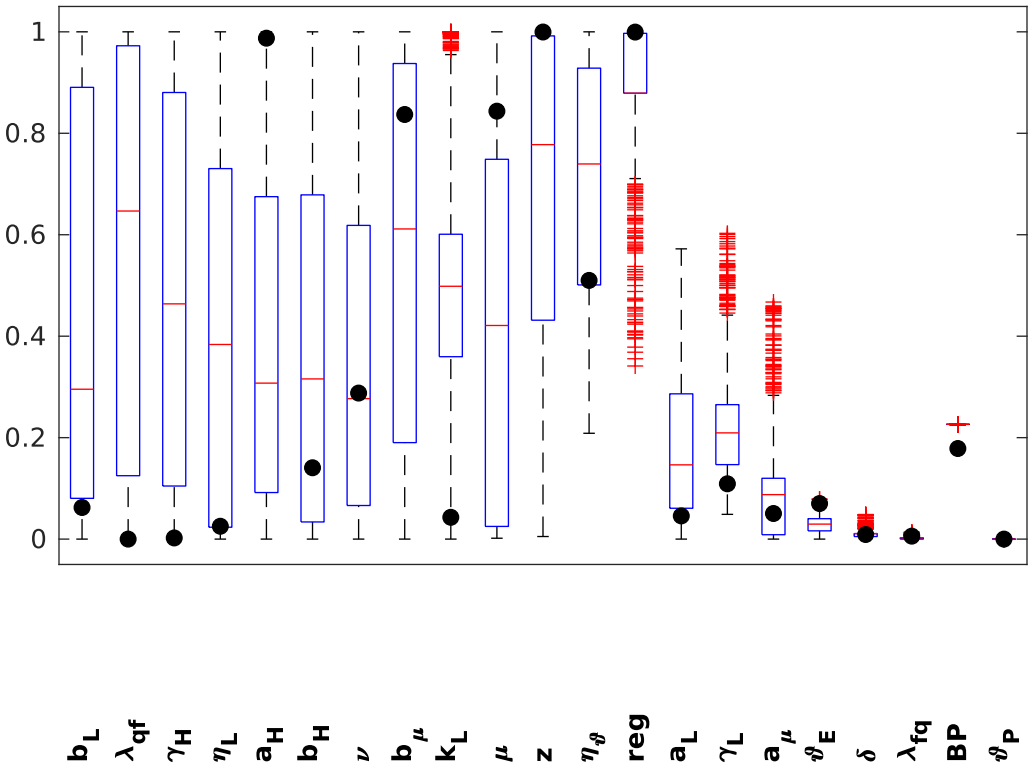
The number of estimations needed to perform the validation was1000.

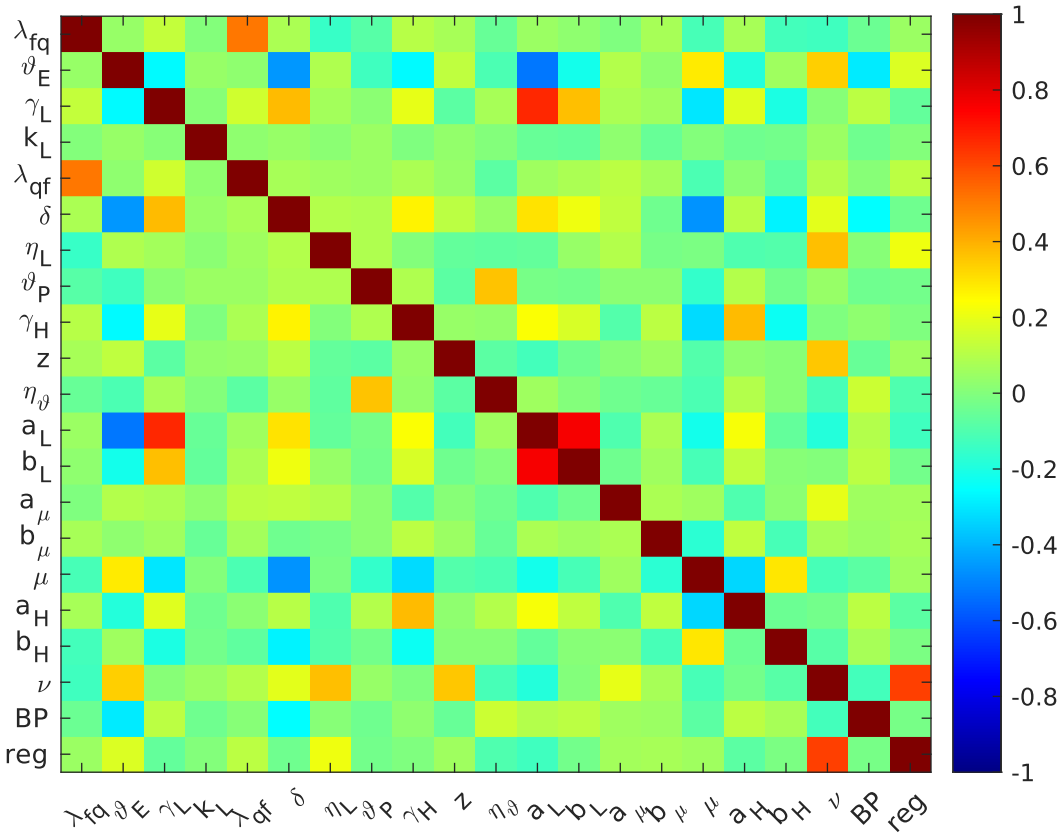
## 4.2. Estimated parameters with their intervals

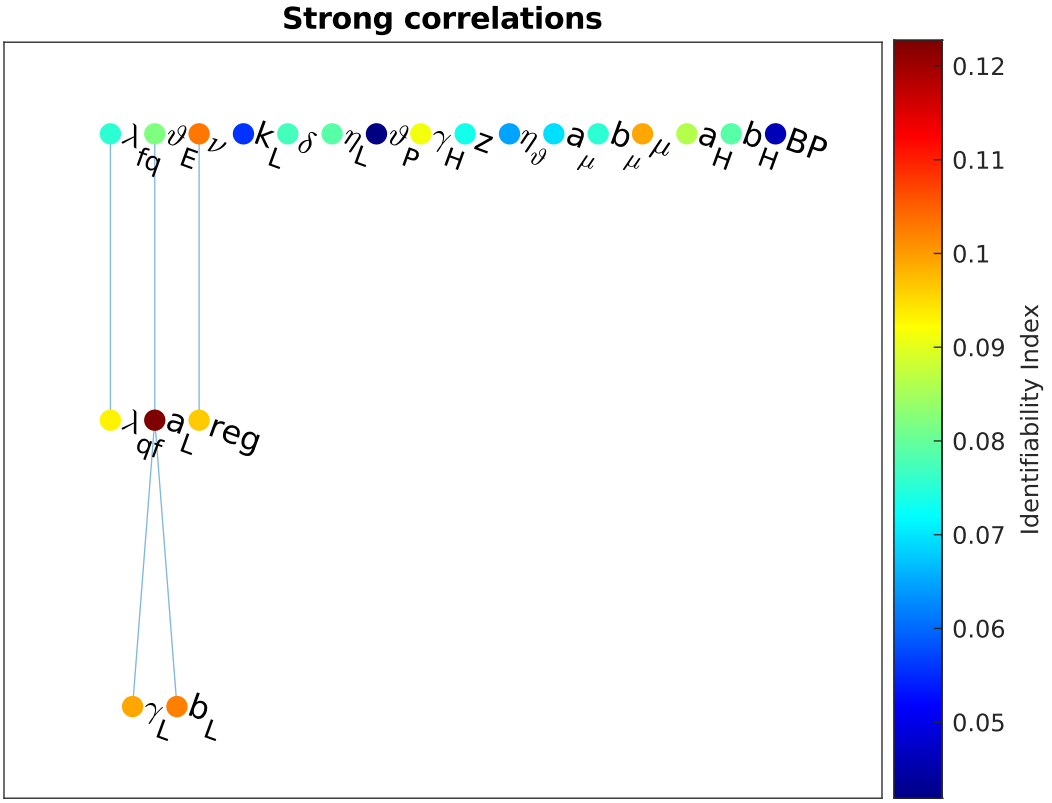
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0.0345' | '0.0025' | '0.0058' | '0.0756' |
| **\vartheta_E** | '0.0277' | '0.0314' | '0.0296' | '0.0701' | '0.0822' |
| **\gamma_L** | '0.1862' | '0.2326' | '0.2094' | '0.109' | '0.0994' |
| **k_L** | '5.2581' | '5.7134' | '5.4858' | '1.3868' | '0.0561' |
| **\lambda_{qf}** | '0.611' | '0.6825' | '0.6467' | '0' | '0.0932' |
| **\delta** | '0.0001' | '0.0031' | '0.0016' | '0.0014' | '0.0773' |
| **\eta_L** | '0.3488' | '0.4185' | '0.3837' | '0.0253' | '0.0791' |
| **\vartheta_P** | '0' | '0' | '0' | '0' | '0.0419' |
| **\gamma_H** | '0.428' | '0.4995' | '0.4637' | '0.0023' | '0.0914' |
| **z** | '22.3775' | '24.2798' | '23.3287' | '29.9887' | '0.0736' |
| **\eta_\vartheta** | '0.7177' | '0.7614' | '0.7395' | '0.51' | '0.0649' |
| **a_L** | '2.8305' | '3.2681' | '3.0493' | '1.6403' | '0.1227' |
| **b_L** | '4.6171' | '5.6556' | '5.1363' | '1.8725' | '0.1025' |
| **a_\mu** | '1.8206' | '2.6338' | '2.2272' | '1.7064' | '0.0695' |
| **b_\mu** | '9.0661' | '10.0537' | '9.5599' | '12.7188' | '0.0756' |
| **\mu** | '0.3859' | '0.4563' | '0.4211' | '0.8436' | '0.0991' |
| **a_H** | '4.8396' | '5.7699' | '5.3047' | '14.8244' | '0.0863' |
| **b_H** | '4.9515' | '5.8901' | '5.4208' | '2.969' | '0.0791' |
| **\nu** | '123.4372' | '153.4756' | '138.4564' | '143.9323' | '0.1029' |
| **BP** | '138.3318' | '138.6682' | '138.5' | '132.5' | '0.046' |
| **reg** | '0.2103' | '0.2292' | '0.2198' | '0.2499' | '0.0963' |

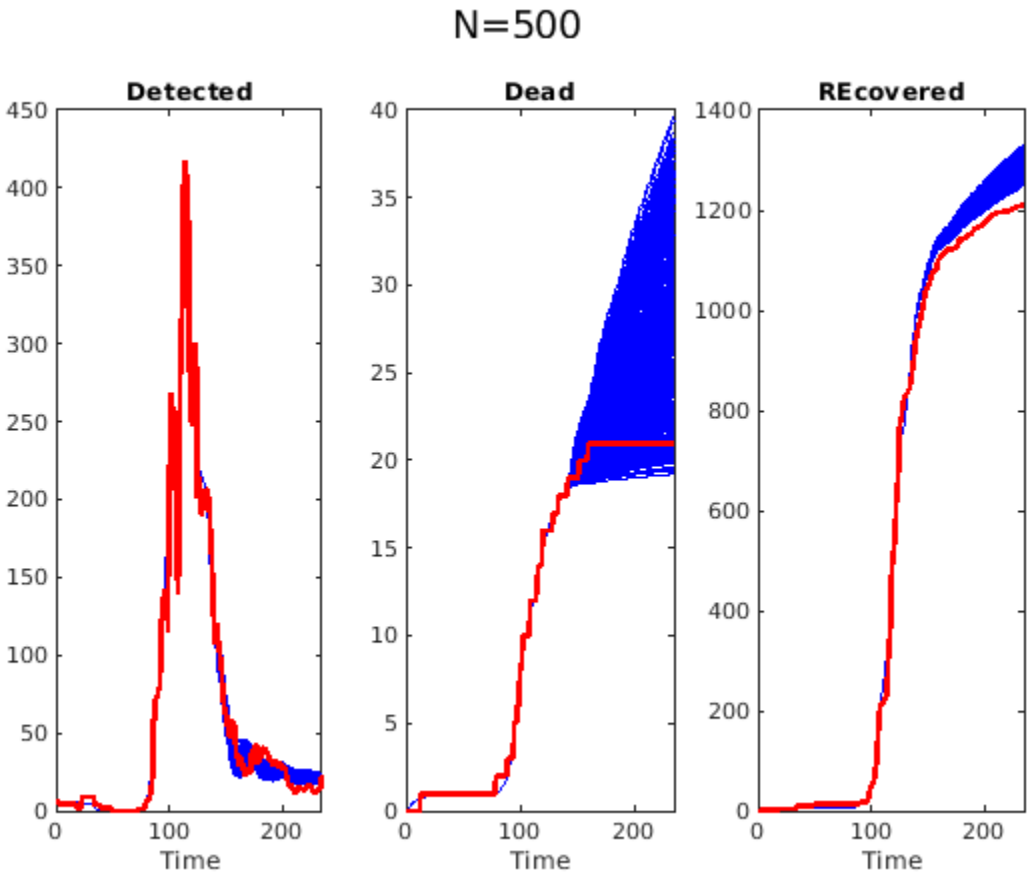
## 4.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
reg
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 4.4. Uncertainty analisys



# Chapter 5. Extension number5

## 5.1. Basic information

The extension to be validated consists of the time series from the data236 to the 278. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

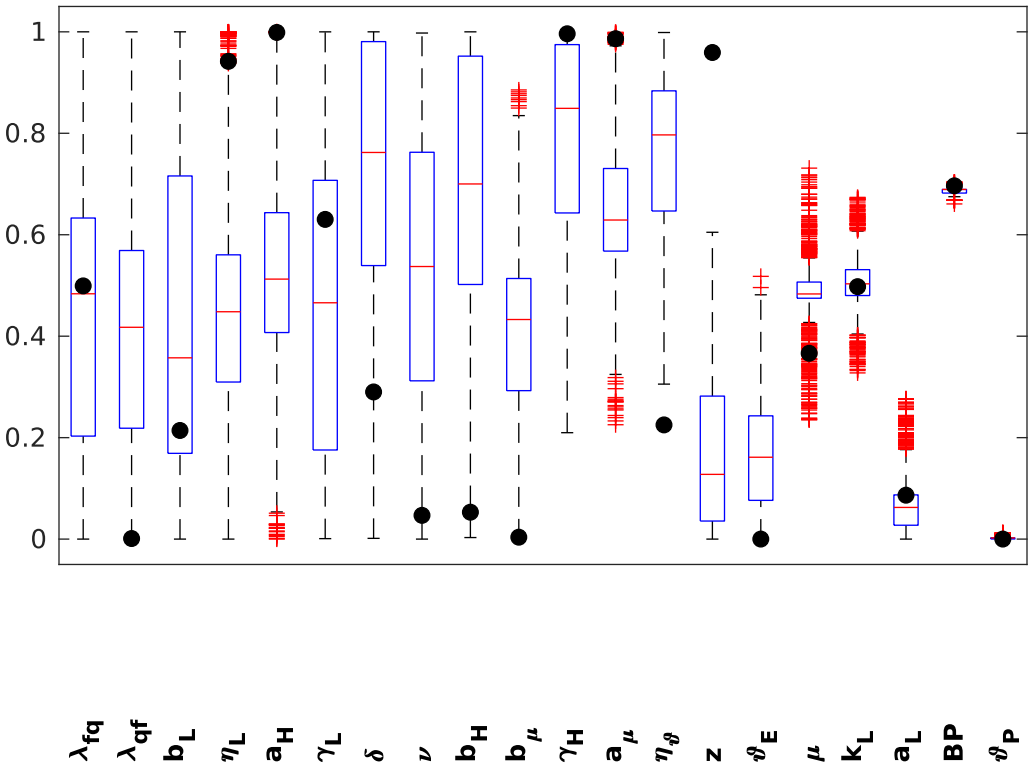
## 5.2. Estimated parameters with their intervals

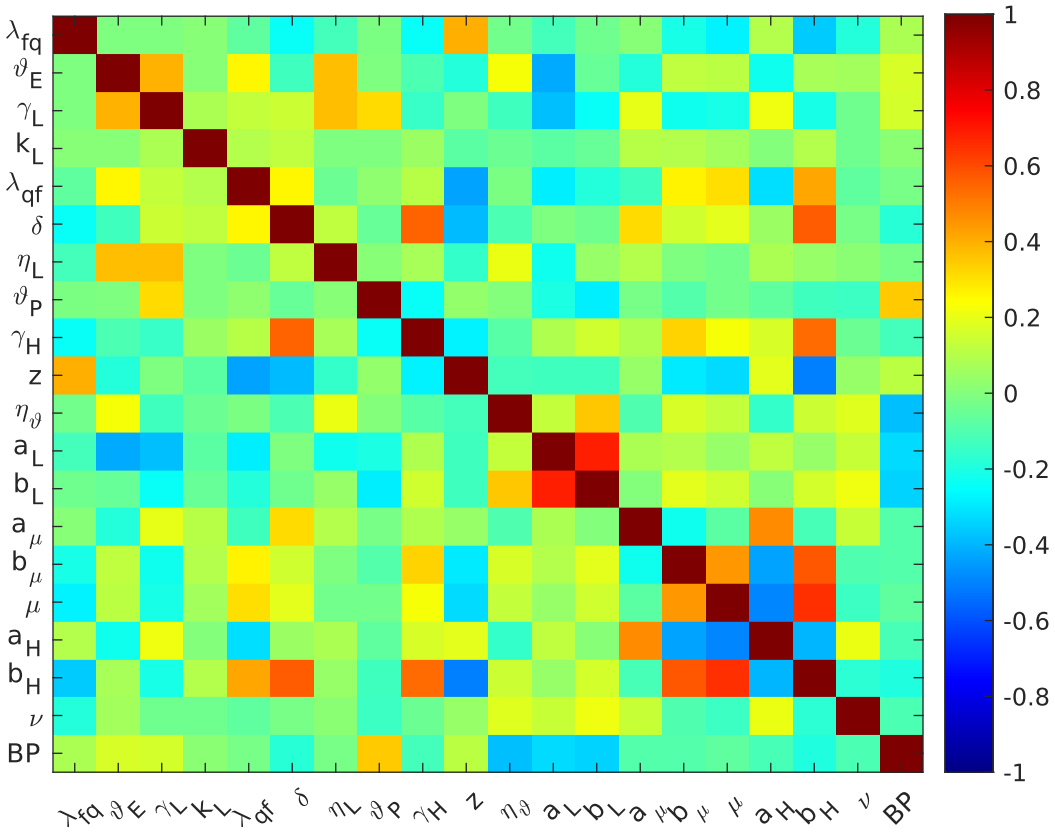
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

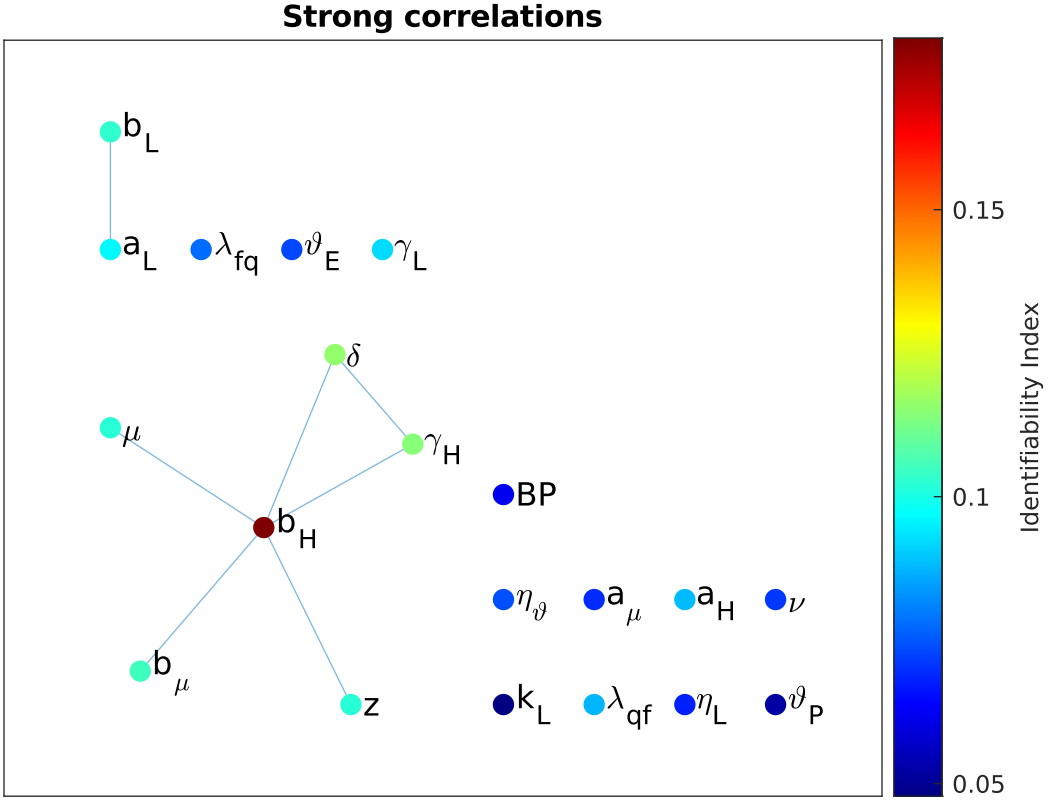
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.2912' | '0.9716' | '0.4836' | '0.4991' | '0.0778' |
| **\vartheta_E** | '0' | '0.0001' | '0.1615' | '0.0001' | '0.0733' |
| **\gamma_L** | '0.6233' | '0.8267' | '0.4659' | '0.6302' | '0.0927' |
| **k_L** | '1.225' | '10' | '5.5289' | '5.4788' | '0.0478' |
| **\lambda_{qf}** | '0' | '0.0025' | '0.4176' | '0.0011' | '0.0877' |
| **\delta** | '0.026' | '0.0789' | '0.1143' | '0.0435' | '0.1163' |
| **\eta_L** | '0' | '1' | '0.4482' | '0.9418' | '0.0683' |
| **\vartheta_P** | '0' | '0.0004' | '0.0023' | '0.0001' | '0.0523' |
| **\gamma_H** | '0.19' | '1' | '0.8491' | '0.9962' | '0.1144' |
| **z** | '8.108' | '28.8788' | '3.8498' | '28.7776' | '0.1021' |
| **\eta_\vartheta** | '0.2204' | '0.2623' | '0.7968' | '0.2251' | '0.0746' |
| **a_L** | '2.1918' | '2.5808' | '1.8748' | '2.2118' | '0.0963' |
| **b_L** | '2.6816' | '4.6558' | '6.0029' | '3.998' | '0.1034' |
| **a_\mu** | '7.0791' | '15' | '9.805' | '14.8102' | '0.07' |
| **b_\mu** | '1' | '8.5325' | '7.0626' | '1.0526' | '0.1052' |
| **\mu** | '0' | '0.7913' | '0.4833' | '0.3663' | '0.1022' |
| **a_H** | '5.6673' | '15' | '8.1754' | '14.9829' | '0.0883' |
| **b_H** | '1' | '12.5231' | '10.8014' | '1.7424' | '0.1799' |
| **\nu** | '3.5522' | '50.6647' | '268.6704' | '23.4125' | '0.0715' |
| **BP** | '235.4601' | '239.3921' | '234.5' | '235.5' | '0.0621' |

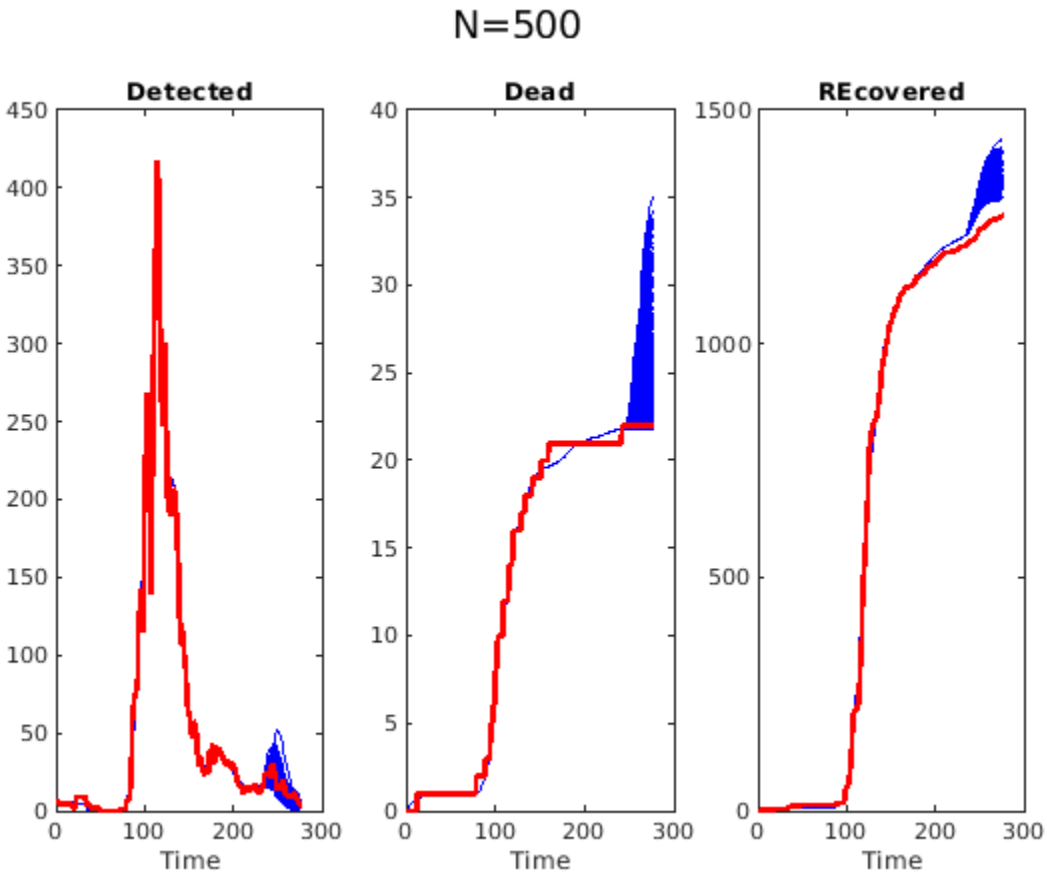
## 5.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
b L
a L
λ fq
ϑ E
γ L
δ
μ
γ H
b H
BP
η ϑ
a μ
a H
ν
b μ
z
k L
λ qf
η L
ϑ P
0.15
0.1
0.05
Identifiability Index

## 5.4. Uncertainty analisys



# Chapter 6. Extension number6

## 6.1. Basic information

The extension to be validated consists of the time series from the data278 to the 310. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

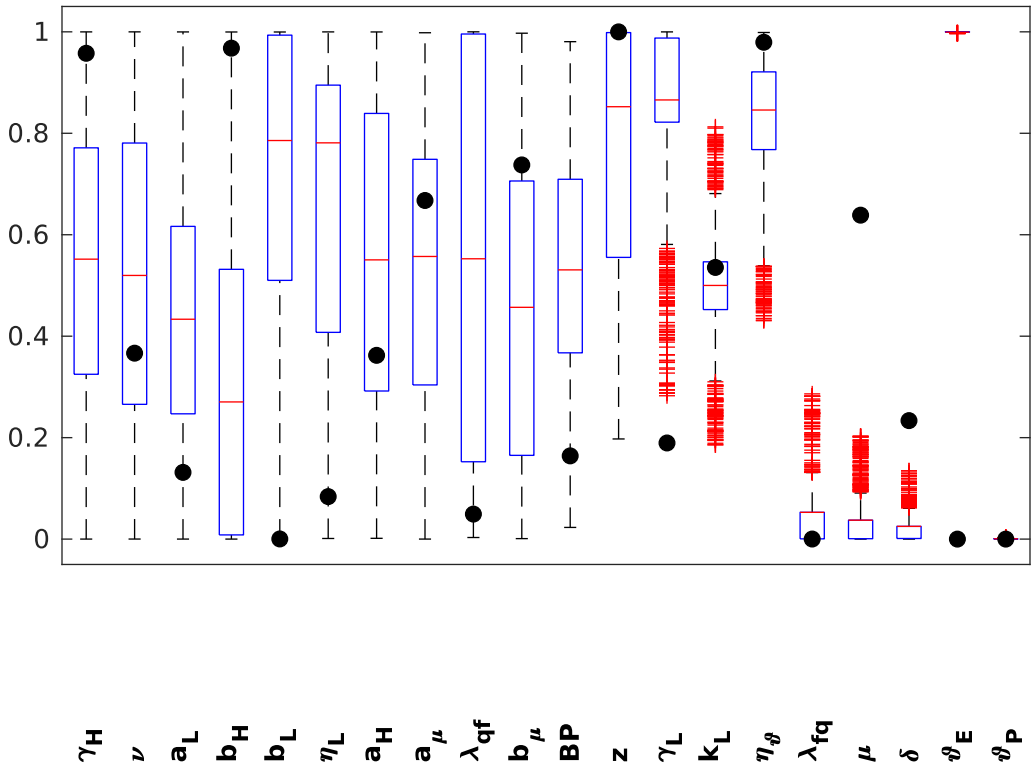
## 6.2. Estimated parameters with their intervals

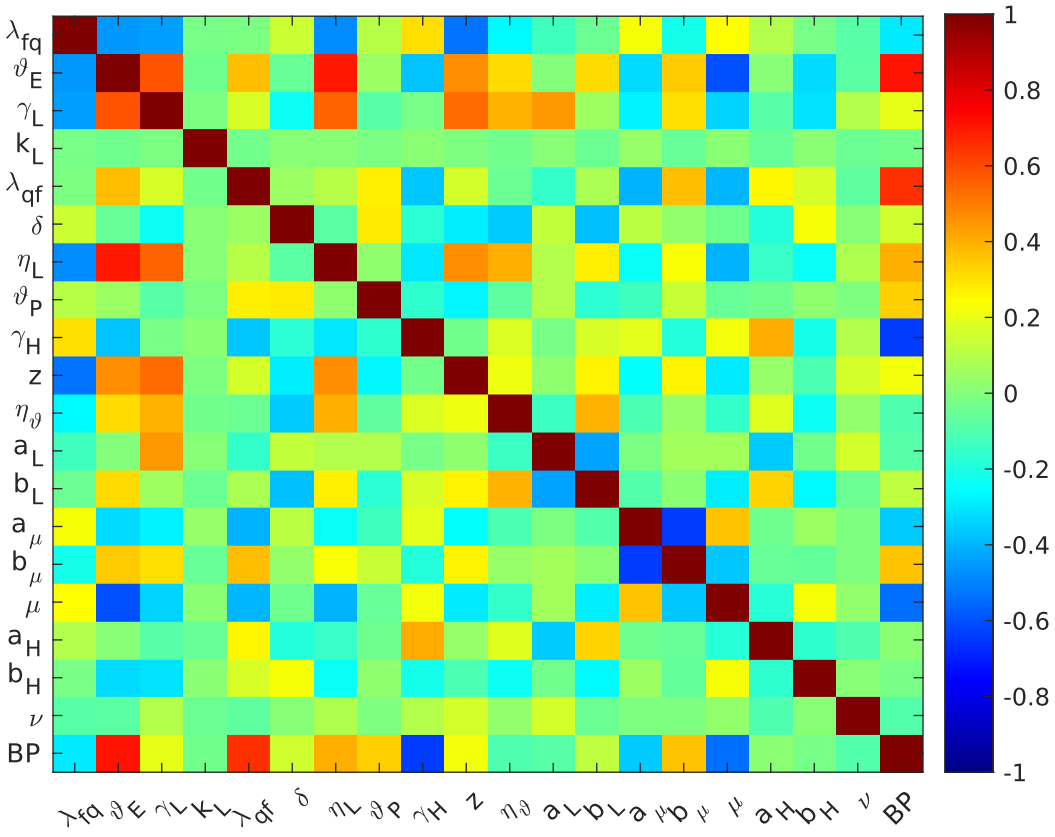
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

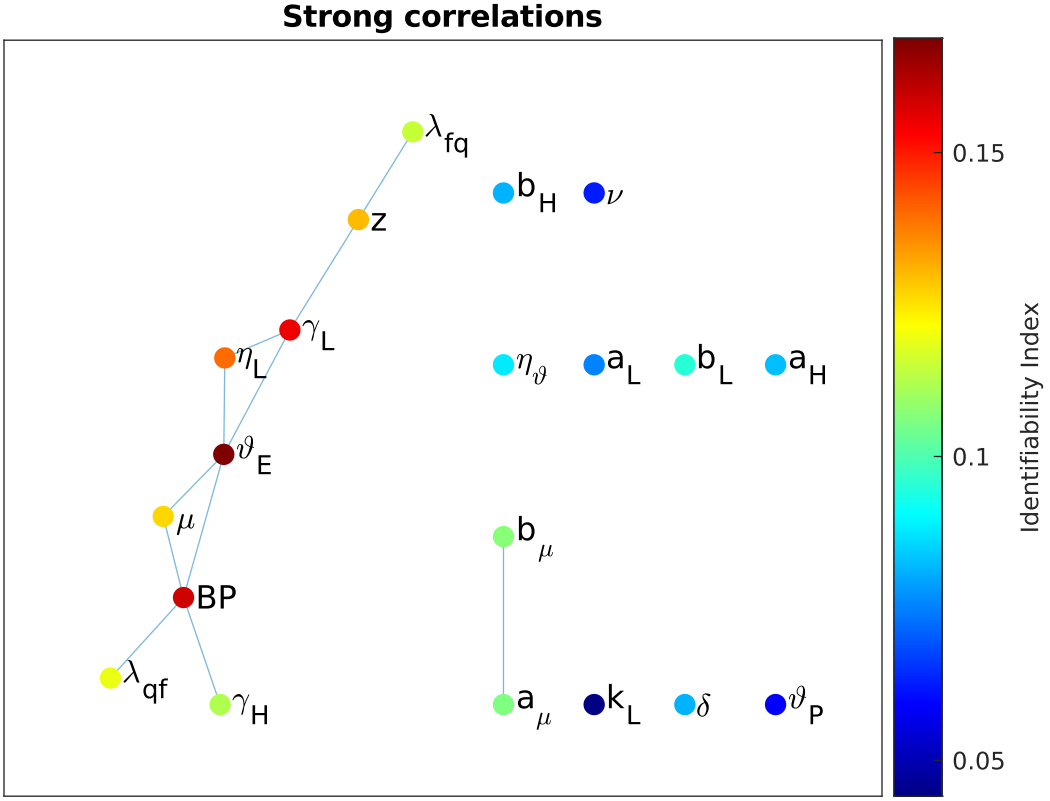
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.0001' | '0.0052' | '0.0528' | '0.0001' | '0.1152' |
| **\vartheta_E** | '0' | '0' | '0.9994' | '0' | '0.1688' |
| **\gamma_L** | '0.1714' | '0.6394' | '0.8657' | '0.1895' | '0.1551' |
| **k_L** | '1' | '8.452' | '5.5004' | '5.8199' | '0.0441' |
| **\lambda_{qf}** | '0.0485' | '0.062' | '0.5526' | '0.0493' | '0.1193' |
| **\delta** | '0.0271' | '0.0374' | '0.0038' | '0.035' | '0.0814' |
| **\eta_L** | '0.0156' | '0.1395' | '0.7811' | '0.0838' | '0.1398' |
| **\vartheta_P** | '0' | '0' | '0.0005' | '0' | '0.0592' |
| **\gamma_H** | '0.4554' | '0.9717' | '0.5519' | '0.9577' | '0.1121' |
| **z** | '23.6265' | '30' | '25.5633' | '29.9972' | '0.1303' |
| **\eta_\vartheta** | '0.6026' | '1' | '0.8458' | '0.9794' | '0.0882' |
| **a_L** | '2.7366' | '3.9718' | '7.0681' | '2.8414' | '0.0756' |
| **b_L** | '1' | '1.6616' | '12.0002' | '1.0042' | '0.0955' |
| **a_\mu** | '7.2114' | '15' | '8.8002' | '10.3454' | '0.1062' |
| **b_\mu** | '1.2318' | '12.592' | '7.3968' | '11.3265' | '0.107' |
| **\mu** | '0.025' | '0.8323' | '0.0373' | '0.6386' | '0.1266' |
| **a_H** | '4.8732' | '6.3442' | '8.7063' | '6.0718' | '0.083' |
| **b_H** | '9.6504' | '15' | '4.7857' | '14.5489' | '0.0812' |
| **\nu** | '155.2219' | '198.8817' | '259.8791' | '183.2542' | '0.0629' |
| **BP** | '245.1018' | '249.7878' | '269.9657' | '246.5' | '0.1587' |

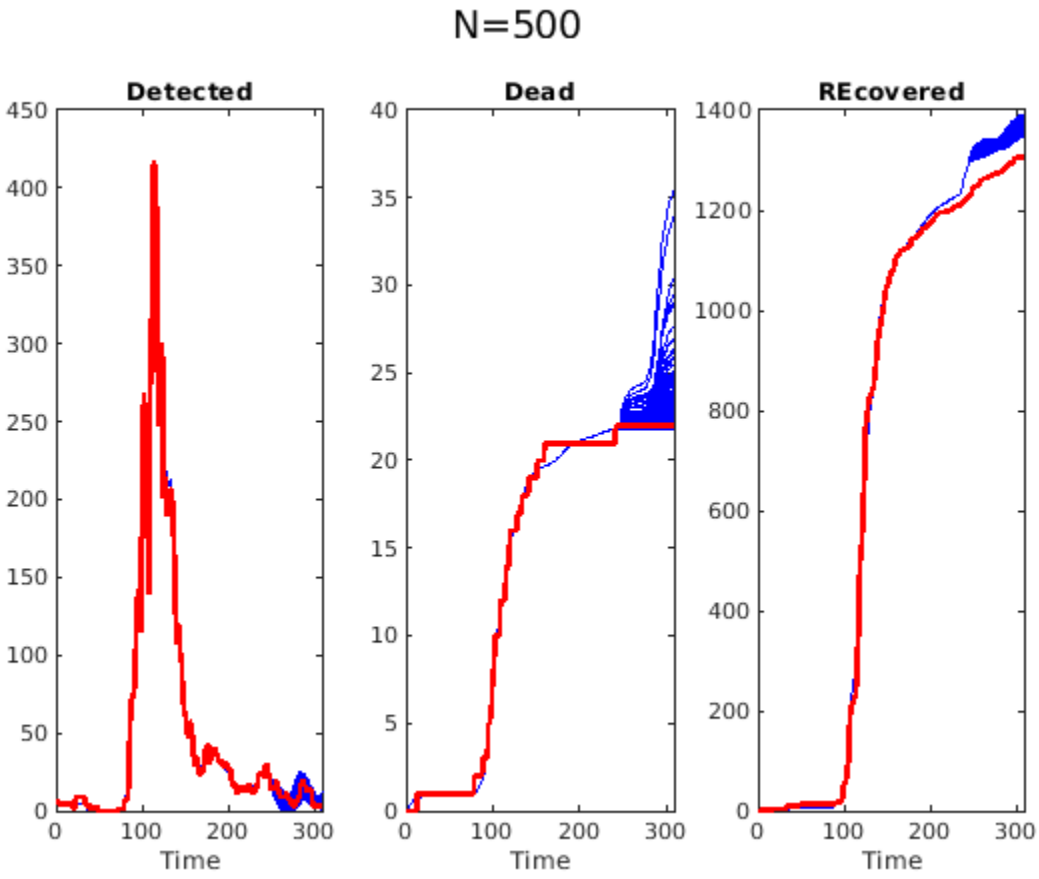
## 6.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\lambda_{fq}$
z
$\gamma_L$
$\eta_L$
$\vartheta_E$
$\mu$
BP
$\lambda_{qf}$
$\gamma_H$
$b_H$
$\nu$
$\eta_\vartheta$
$a_L$
$b_L$
$a_H$
$b_\mu$
$a_\mu$
$k_L$
$\delta$
$\vartheta_P$
0.15
0.1
0.05
Identifiability Index

## 6.4. Uncertainty analisys



# Chapter 7. Extension number7

## 7.1. Basic information

The extension to be validated consists of the time series from the data310 to the 331. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

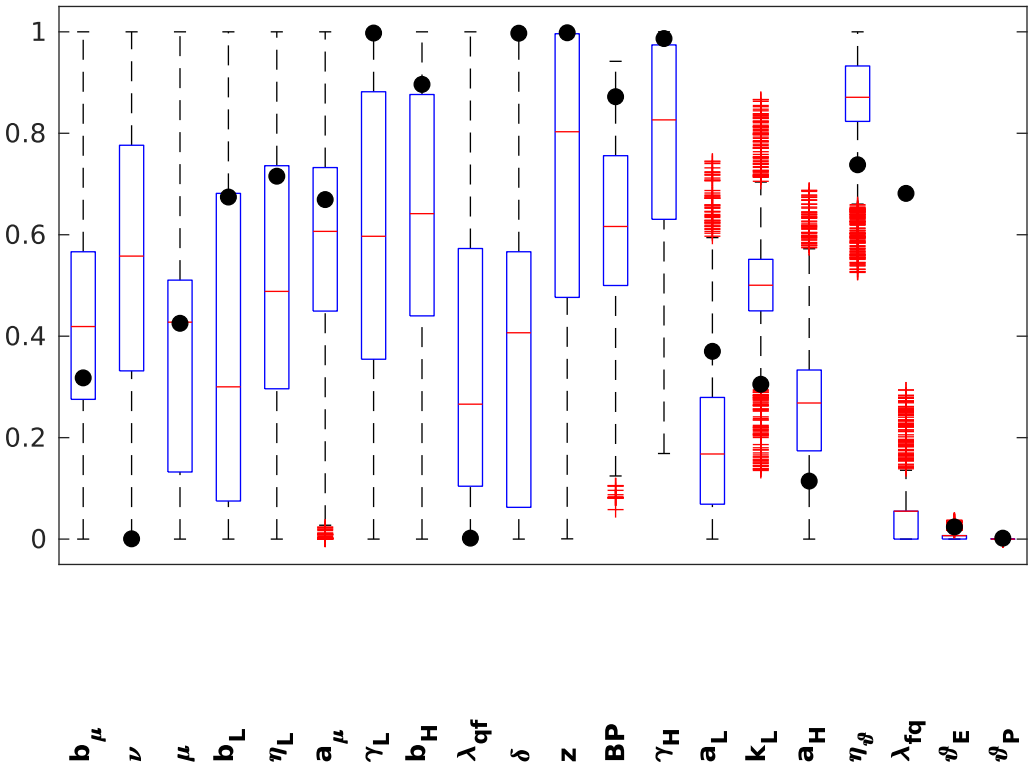
## 7.2. Estimated parameters with their intervals

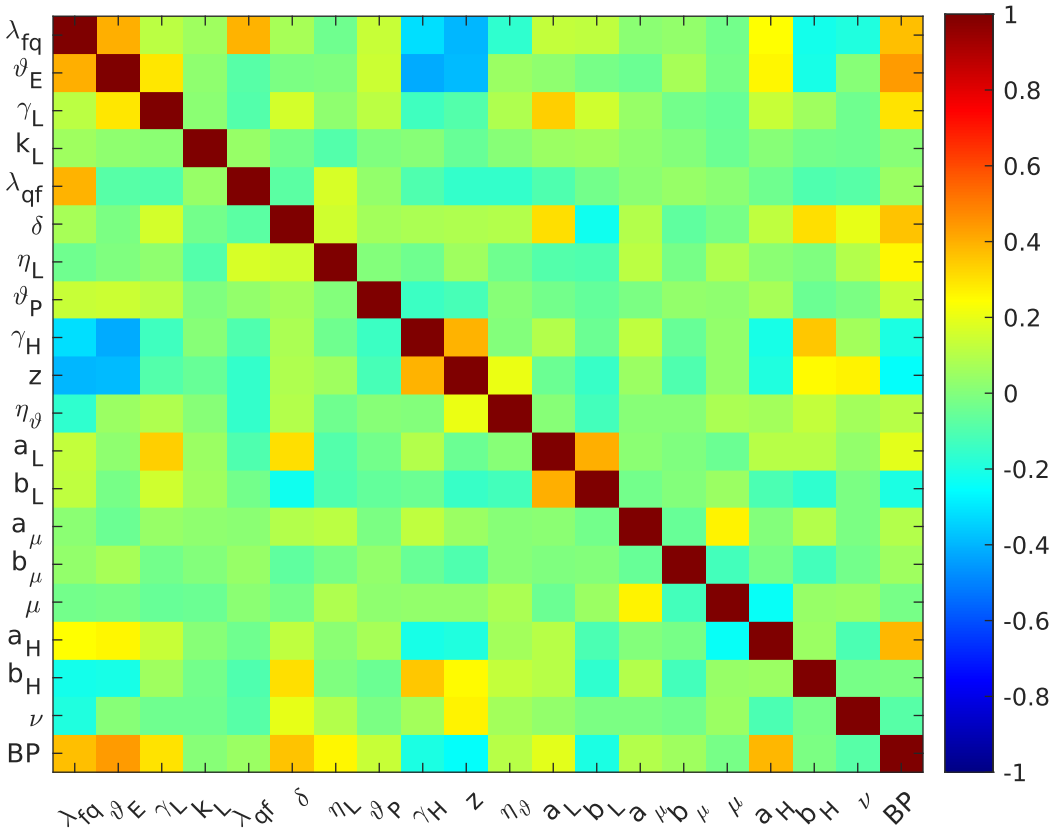
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

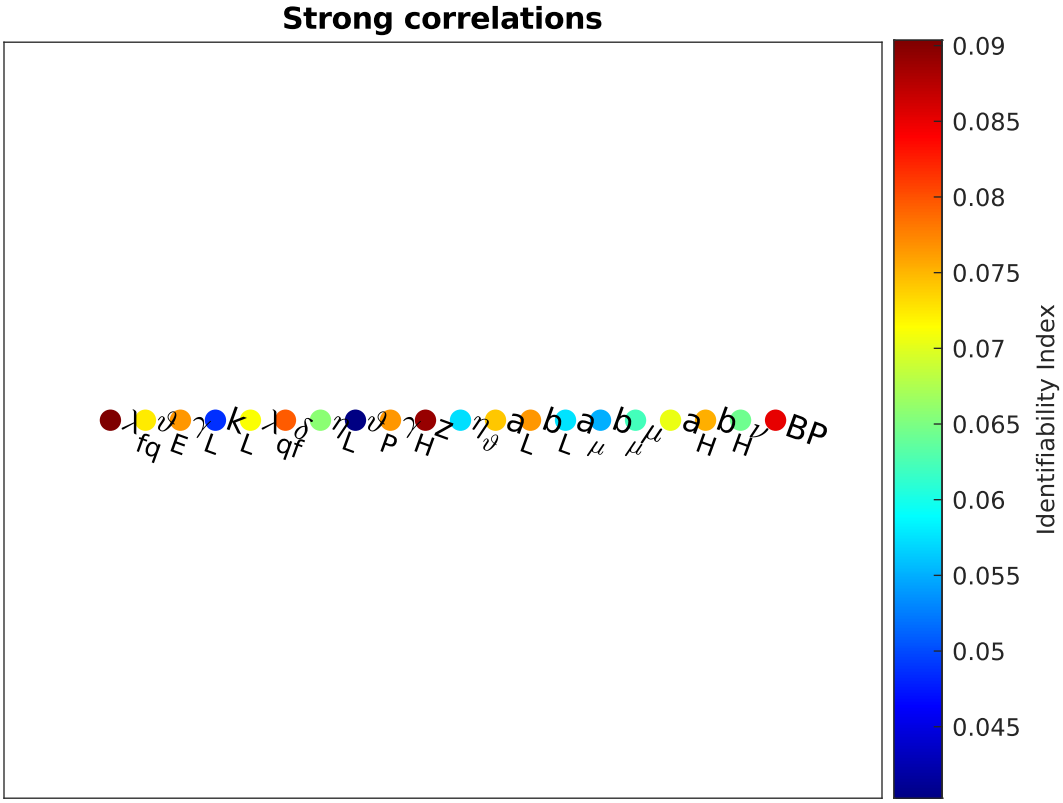
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.4483' | '1' | '0.0551' | '0.6815' | '0.0904' |
| **\vartheta_E** | '0.0061' | '0.05' | '0.0069' | '0.024' | '0.0724' |
| **\gamma_L** | '0.4021' | '1' | '0.5969' | '0.9976' | '0.0766' |
| **k_L** | '1' | '9.55' | '5.5041' | '3.7472' | '0.0487' |
| **\lambda_{qf}** | '0' | '0.0041' | '0.266' | '0.0019' | '0.0713' |
| **\delta** | '0.0429' | '0.15' | '0.061' | '0.1496' | '0.0794' |
| **\eta_L** | '0' | '0.96' | '0.4883' | '0.7154' | '0.0658' |
| **\vartheta_P** | '0.0015' | '0.003' | '0' | '0.0018' | '0.0403' |
| **\gamma_H** | '0.3975' | '1' | '0.8263' | '0.9867' | '0.0767' |
| **z** | '18.1881' | '30' | '24.0911' | '29.9444' | '0.0891' |
| **\eta_\vartheta** | '0.7095' | '0.8' | '0.8709' | '0.7379' | '0.0573' |
| **a_L** | '5.1454' | '10.8752' | '3.3503' | '6.1822' | '0.0742' |
| **b_L** | '7.7727' | '11.1443' | '5.2023' | '10.4403' | '0.0766' |
| **a_\mu** | '4.0739' | '15' | '9.4928' | '10.3704' | '0.0576' |
| **b_\mu** | '1.896' | '14.3448' | '6.8663' | '5.4497' | '0.055' |
| **\mu** | '0.0929' | '0.9103' | '0.4276' | '0.4254' | '0.0623' |
| **a_H** | '1.4191' | '4.956' | '4.7562' | '2.6015' | '0.0706' |
| **b_H** | '4.2409' | '14.4516' | '9.9817' | '13.5494' | '0.0753' |
| **\nu** | '0.0116' | '0.5799' | '278.9419' | '0.2685' | '0.0645' |
| **BP** | '313.7062' | '315.5454' | '304.5' | '315.5' | '0.0852' |

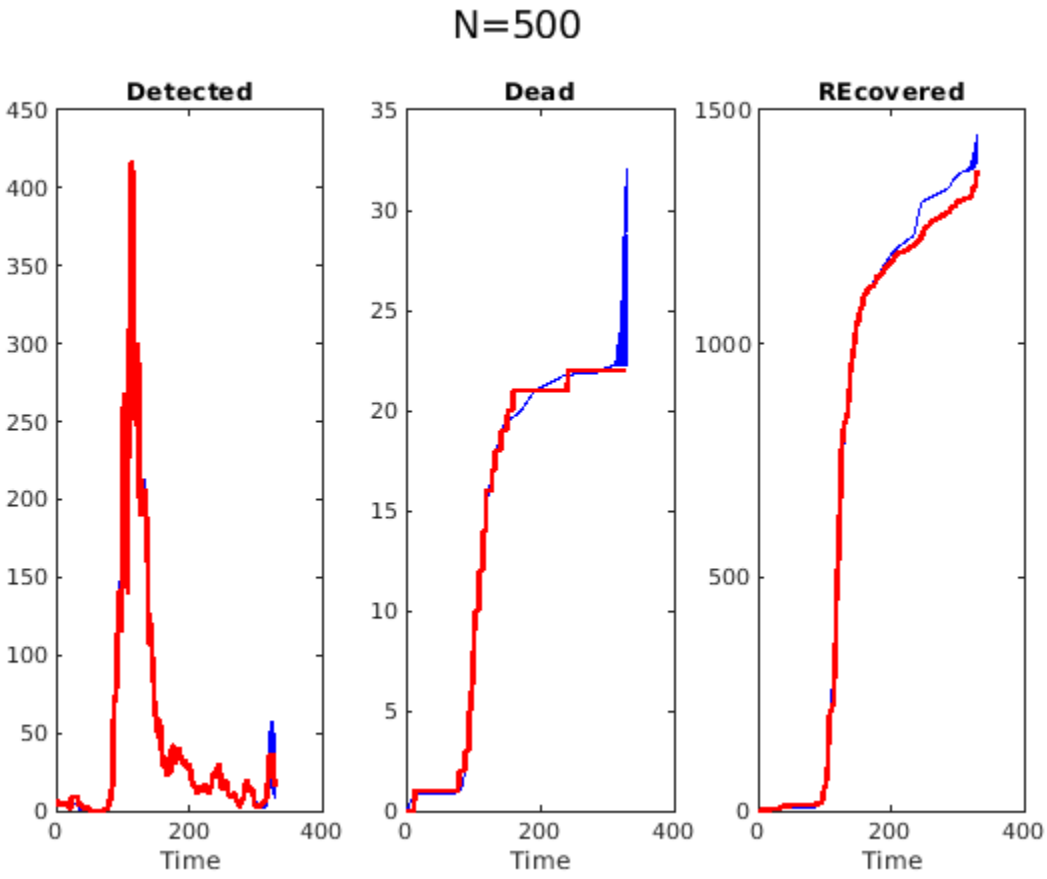
## 7.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0.045
Identifiability Index

## 7.4. Uncertainty analisys



# Chapter 8. Extension number8

## 8.1. Basic information

The extension to be validated consists of the time series from the data331 to the 331. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

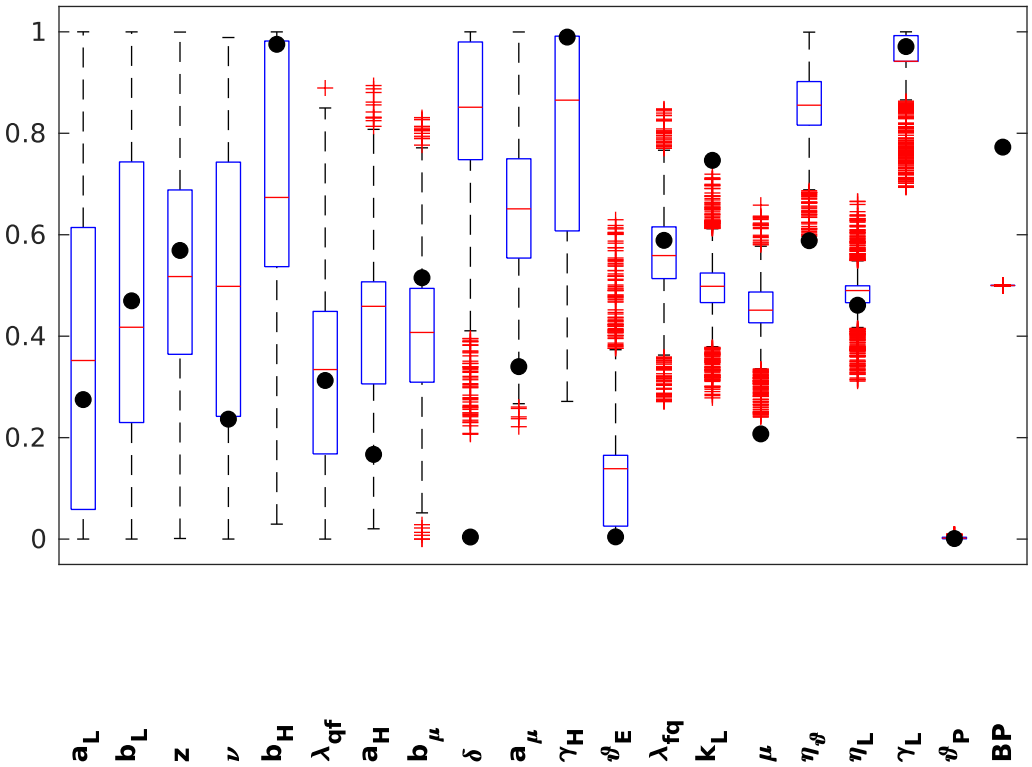
## 8.2. Estimated parameters with their intervals

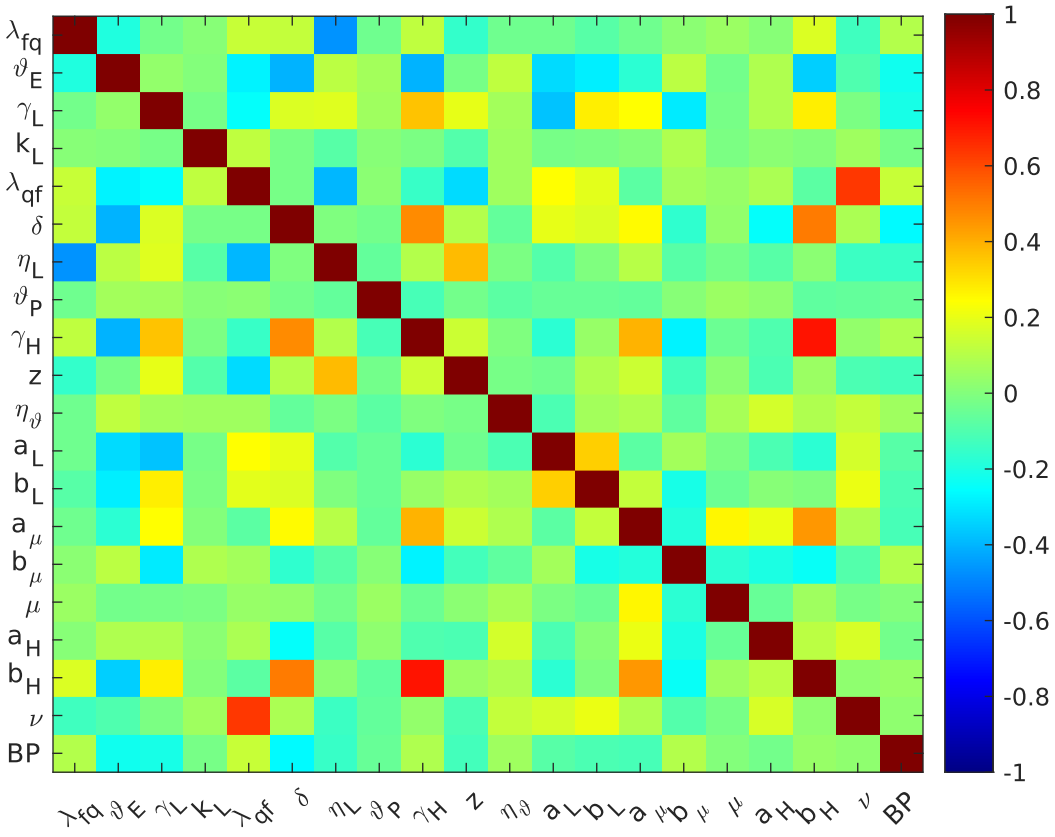
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

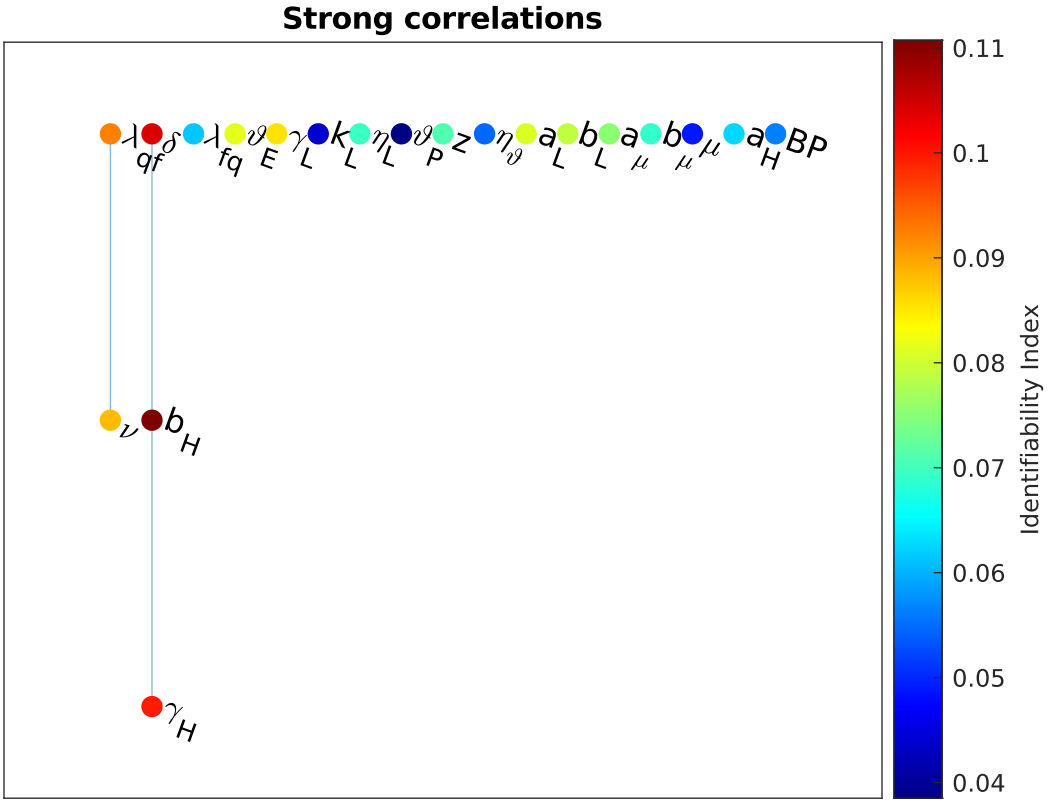
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.5889' | '0.5889' | '0.5589' | '0.5889' | '0.0615' |
| **\vartheta_E** | '0.0031' | '0.0066' | '0.1388' | '0.0044' | '0.0815' |
| **\gamma_L** | '0.6796' | '1' | '0.9417' | '0.9709' | '0.0854' |
| **k_L** | '5.4039' | '10' | '5.4852' | '7.7199' | '0.0439' |
| **\lambda_{qf}** | '0.2189' | '0.469' | '0.3343' | '0.3127' | '0.0924' |
| **\delta** | '0.0004' | '0.0009' | '0.1277' | '0.0006' | '0.1042' |
| **\eta_L** | '0.3227' | '0.6916' | '0.4899' | '0.4611' | '0.0698' |
| **\vartheta_P** | '0.0007' | '0.0016' | '0.0018' | '0.0011' | '0.0385' |
| **\gamma_H** | '0.6927' | '1' | '0.8649' | '0.9896' | '0.0996' |
| **z** | '11.9497' | '25.6064' | '15.5272' | '17.0709' | '0.0712' |
| **\eta_\vartheta** | '0.4118' | '0.8824' | '0.8553' | '0.5883' | '0.0547' |
| **a_L** | '3.395' | '7.275' | '5.929' | '4.85' | '0.081' |
| **b_L** | '5.3033' | '11.3643' | '6.847' | '7.5762' | '0.0789' |
| **a_\mu** | '4.032' | '8.64' | '10.1104' | '5.76' | '0.0753' |
| **b_\mu** | '5.7493' | '12.3199' | '6.7052' | '8.2132' | '0.0691' |
| **\mu** | '0.1452' | '0.3111' | '0.4513' | '0.2074' | '0.0491' |
| **a_H** | '2.3362' | '5.0062' | '7.4243' | '3.3375' | '0.0627' |
| **b_H** | '10.2589' | '15' | '10.4293' | '14.6555' | '0.1107' |
| **\nu** | '82.7604' | '177.3437' | '249.1211' | '118.2291' | '0.0882' |
| **BP** | '310' | '321' | '315.5' | '318.5' | '0.0564' |

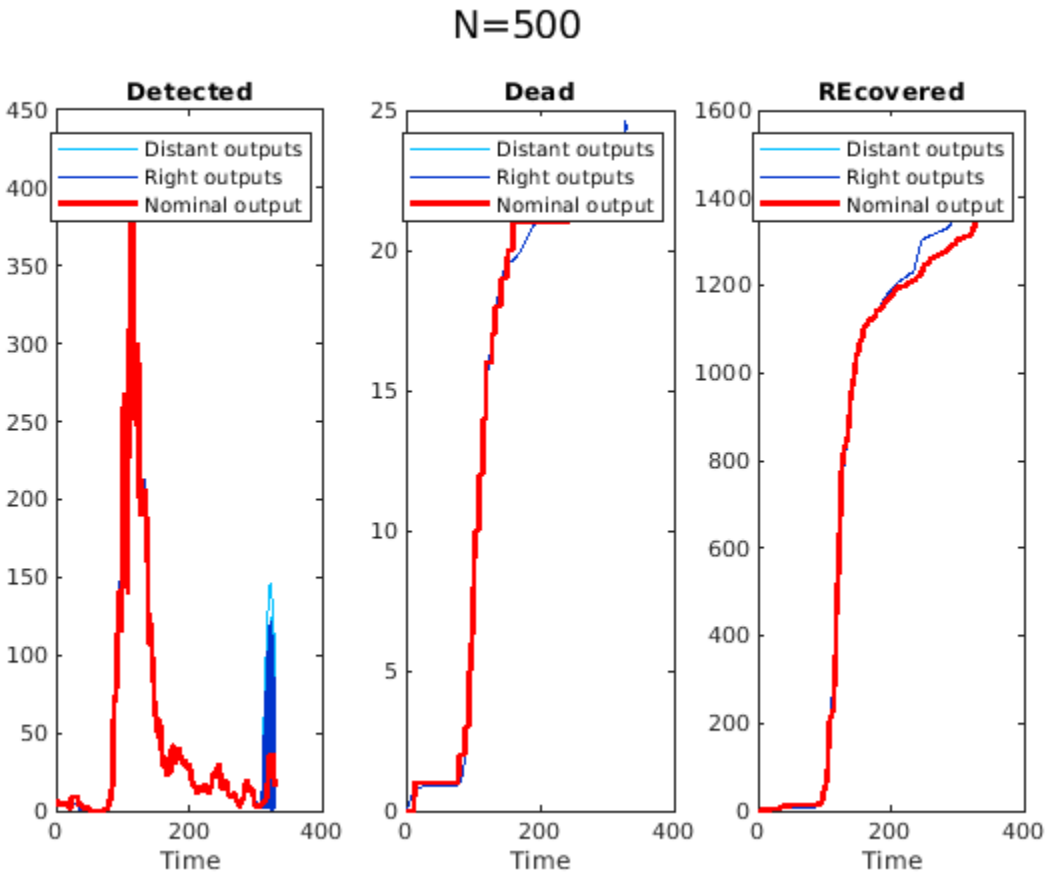
## 8.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\lambda_{qf}$ $\delta$ $\lambda_{fq}$ $\vartheta_E$ $\gamma_L$ $k_L$ $\eta_L$ $\vartheta_P$ $z$ $\eta_\vartheta$ $a_L$ $b_L$ $a_\mu$ $b_\mu$ $\mu$ $a_H$ BP
$\nu$ $b_H$
$\gamma_H$
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
Identifiability Index

## 8.4. Uncertainty analisys



# Chapter 9. Extension number9

## 9.1. Basic information

The extension to be validated consists of the time series from the data331 to the 361. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

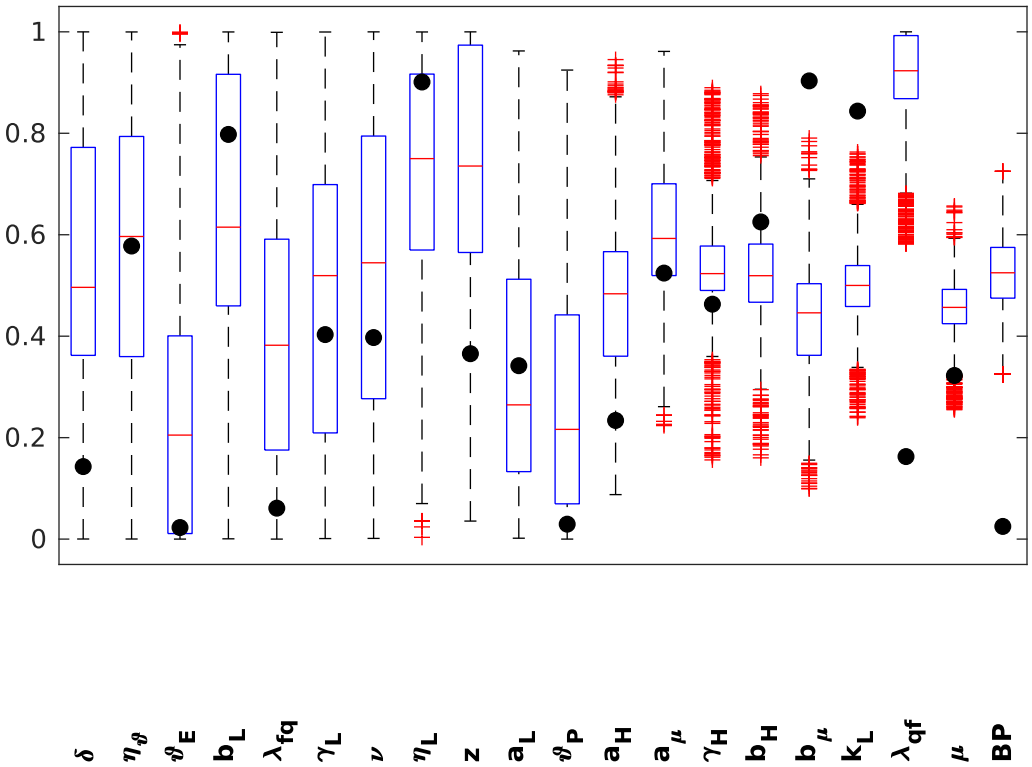
## 9.2. Estimated parameters with their intervals

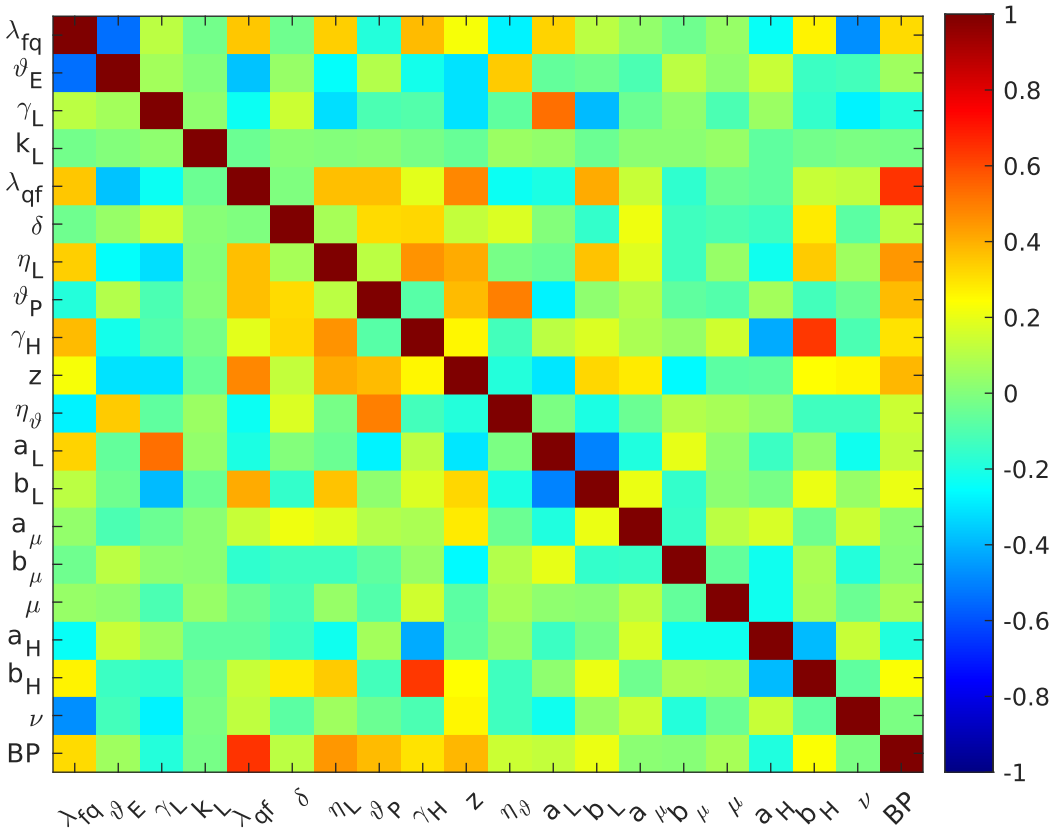
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

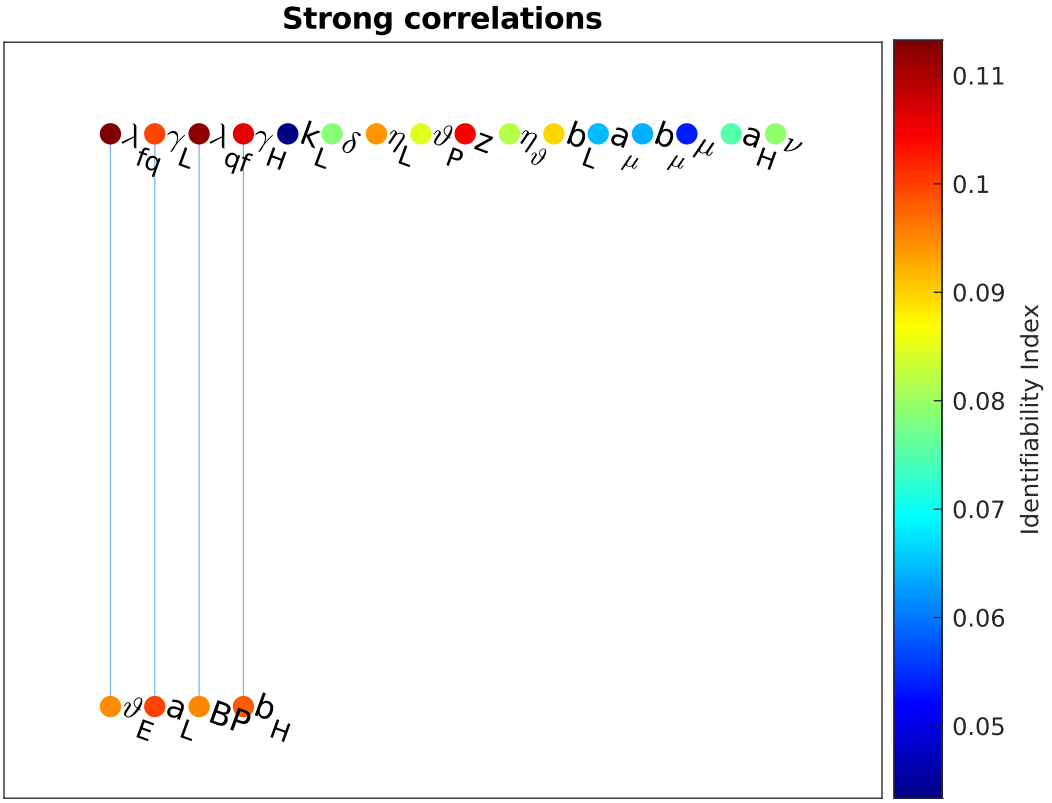
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.0548' | '0.0773' | '0.3822' | '0.061' | '0.1133' |
| **\vartheta_E** | '0.0046' | '0.0471' | '0.205' | '0.0228' | '0.0949' |
| **\gamma_L** | '0.3627' | '0.95' | '0.5194' | '0.4032' | '0.0998' |
| **k_L** | '1' | '9.1225' | '5.5004' | '8.5935' | '0.0433' |
| **\lambda_{qf}** | '0.1622' | '0.2148' | '0.9231' | '0.1627' | '0.1123' |
| **\delta** | '0' | '0.0463' | '0.0744' | '0.0214' | '0.0787' |
| **\eta_L** | '0.5188' | '0.9764' | '0.7501' | '0.9011' | '0.0943' |
| **\vartheta_P** | '0.0282' | '0.1' | '0.2163' | '0.0294' | '0.0847' |
| **\gamma_H** | '0.0738' | '1' | '0.5233' | '0.4631' | '0.1062' |
| **z** | '10.8695' | '15.4434' | '22.063' | '10.9646' | '0.105' |
| **\eta_\vartheta** | '0.2998' | '0.7271' | '0.5965' | '0.5777' | '0.0821' |
| **a_L** | '4.1204' | '5.9026' | '4.7068' | '5.7857' | '0.0997' |
| **b_L** | '7.1523' | '15' | '9.6089' | '12.1685' | '0.0897' |
| **a_\mu** | '1.6913' | '15' | '9.2974' | '8.3417' | '0.0647' |
| **b_\mu** | '1' | '14.44' | '7.2446' | '13.6461' | '0.0639' |
| **\mu** | '0.031' | '0.6966' | '0.4568' | '0.3225' | '0.0539' |
| **a_H** | '1.35' | '15' | '7.7703' | '4.2744' | '0.0752' |
| **b_H** | '1.7' | '14.468' | '8.2695' | '9.7536' | '0.098' |
| **\nu** | '171.9805' | '240.514' | '272.3479' | '198.6582' | '0.0793' |
| **BP** | '331.4557' | '334.4753' | '341.5' | '331.5' | '0.0952' |

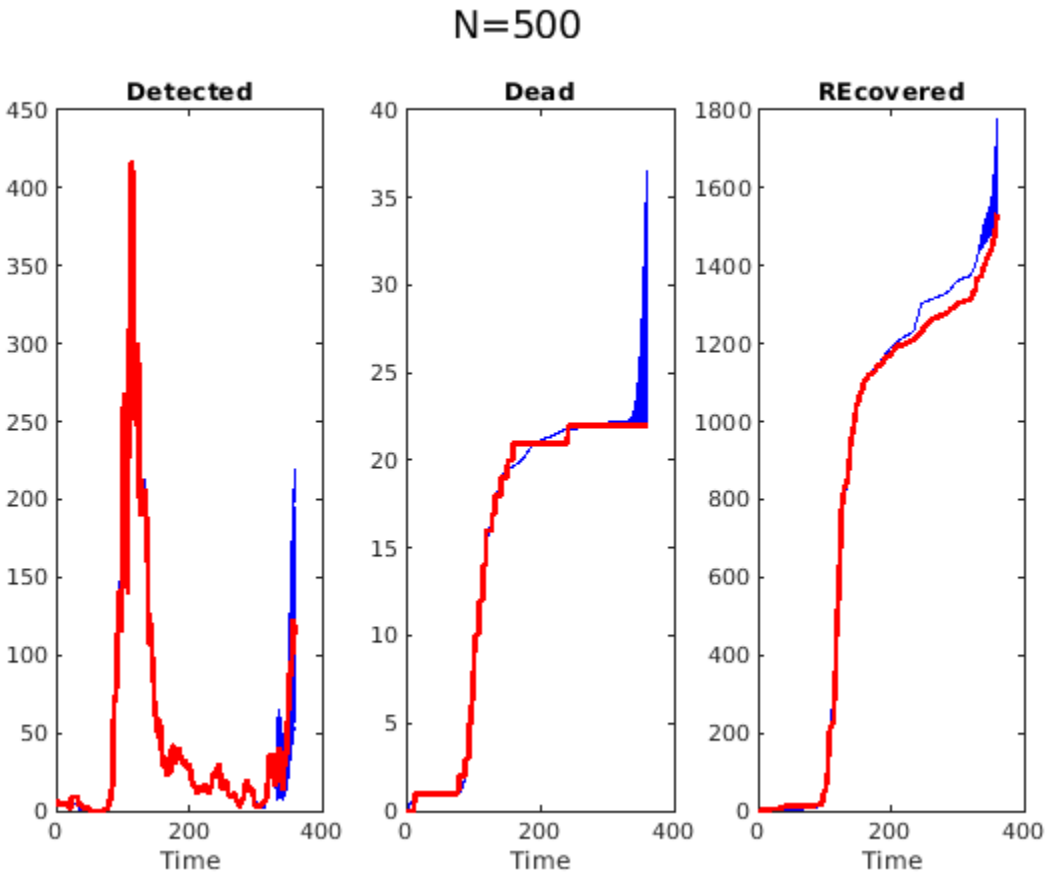
## 9.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 9.4. Uncertainty analisys



# Chapter 10. Extension number10

## 10.1. Basic information

The extension to be validated consists of the time series from the data361 to the 382. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

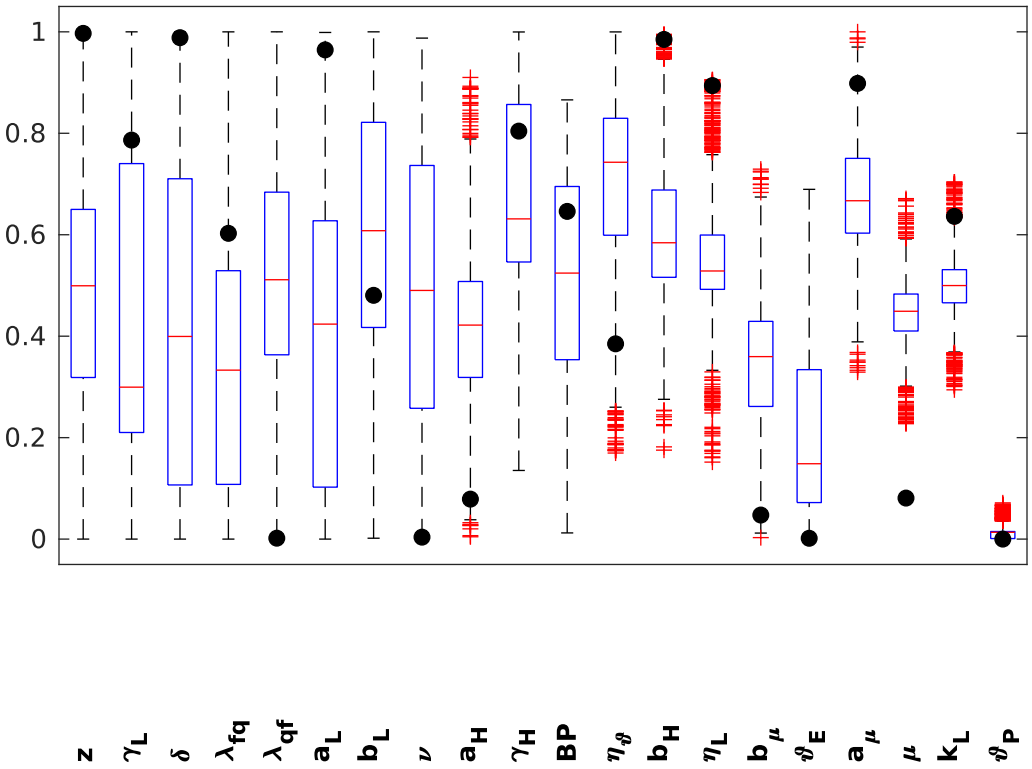
## 10.2. Estimated parameters with their intervals

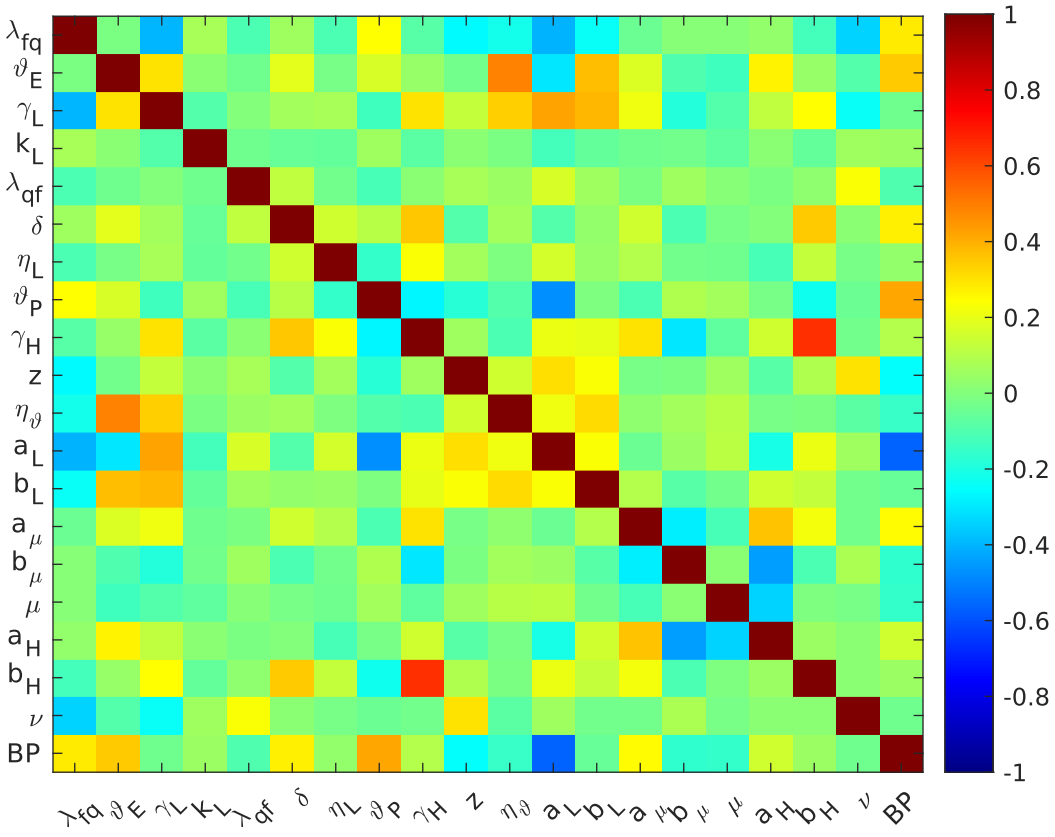
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

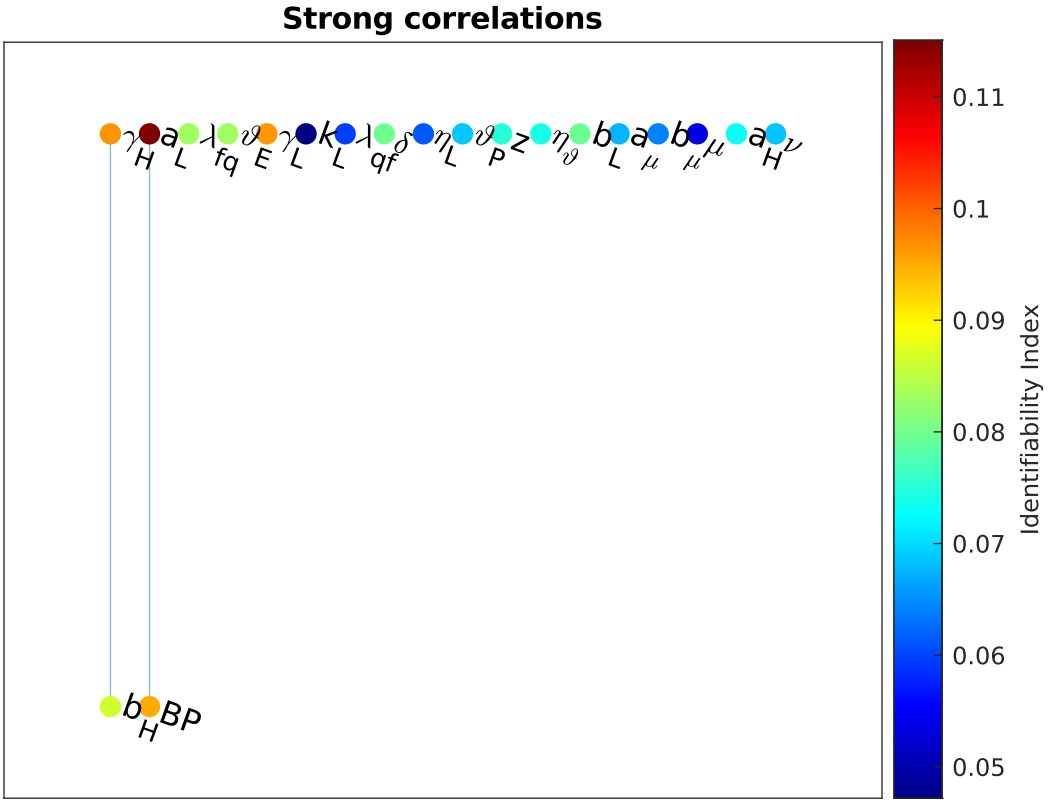
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.3396' | '1' | '0.3331' | '0.6028' | '0.0831' |
| **\vartheta_E** | '0' | '0.0035' | '0.1488' | '0.0016' | '0.0831' |
| **\gamma_L** | '0.2468' | '0.8485' | '0.2995' | '0.7866' | '0.0964' |
| **k_L** | '1' | '10' | '5.4984' | '6.7259' | '0.0472' |
| **\lambda_{qf}** | '0' | '0.0041' | '0.5113' | '0.0018' | '0.0598' |
| **\delta** | '0.0703' | '0.15' | '0.0599' | '0.1483' | '0.08' |
| **\eta_L** | '0.02' | '1' | '0.5286' | '0.894' | '0.0614' |
| **\vartheta_P** | '0' | '0' | '0.0134' | '0' | '0.0688' |
| **\gamma_H** | '0.1695' | '1' | '0.6312' | '0.8043' | '0.0966' |
| **z** | '12.7315' | '30' | '14.9817' | '29.9084' | '0.0752' |
| **\eta_\vartheta** | '0.382' | '0.5247' | '0.7428' | '0.385' | '0.0741' |
| **a_L** | '10.5334' | '14.8134' | '6.9332' | '14.5017' | '0.1151' |
| **b_L** | '6.011' | '10.375' | '9.5114' | '7.7278' | '0.0796' |
| **a_\mu** | '4.6868' | '13.803' | '10.3379' | '13.5765' | '0.0677' |
| **b_\mu** | '1' | '13.6' | '6.0373' | '1.664' | '0.0643' |
| **\mu** | '0' | '0.1478' | '0.4492' | '0.0809' | '0.0538' |
| **a_H** | '1.0949' | '5.5586' | '6.9087' | '2.1034' | '0.0732' |
| **b_H** | '2.8494' | '15' | '9.1786' | '14.7902' | '0.0863' |
| **\nu** | '0' | '4.1044' | '245.0976' | '1.9202' | '0.0685' |
| **BP** | '356.8483' | '363.1458' | '352.5' | '357.4866' | '0.0951' |

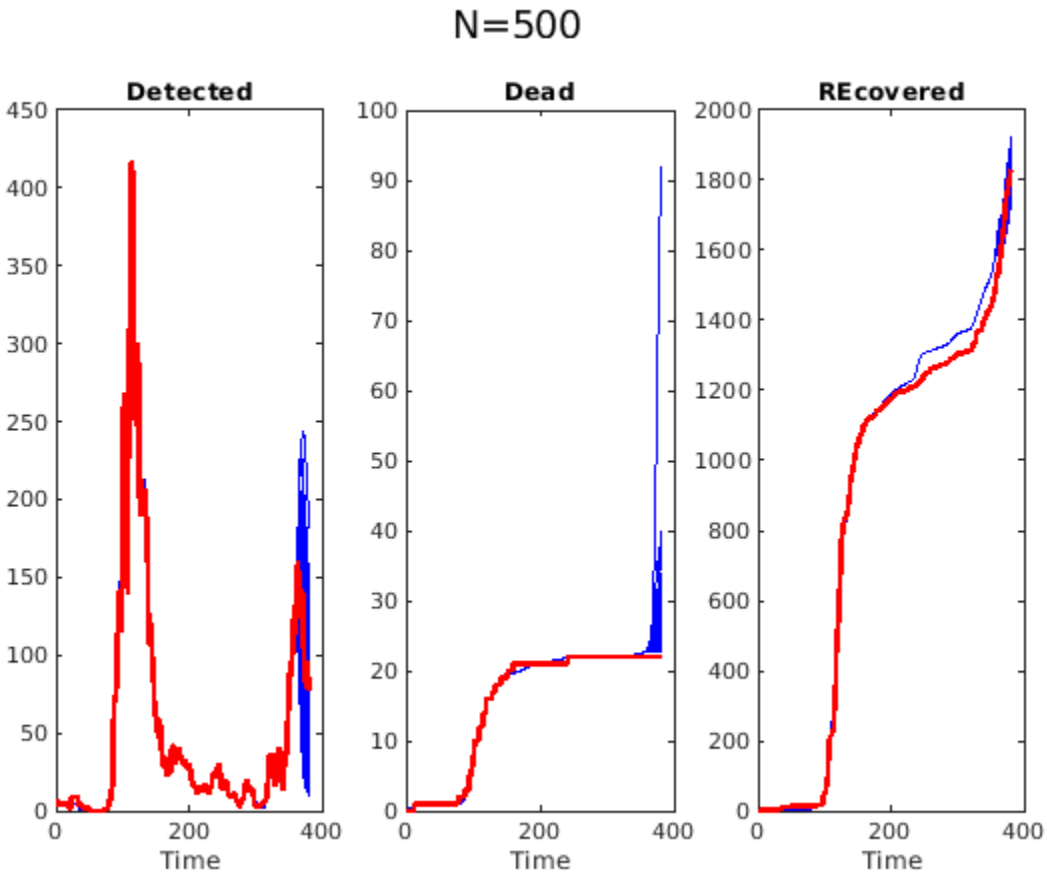
## 10.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 10.4. Uncertainty analisys



# Chapter 11. Extension number11

## 11.1. Basic information

The extension to be validated consists of the time series from the data382 to the 394. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

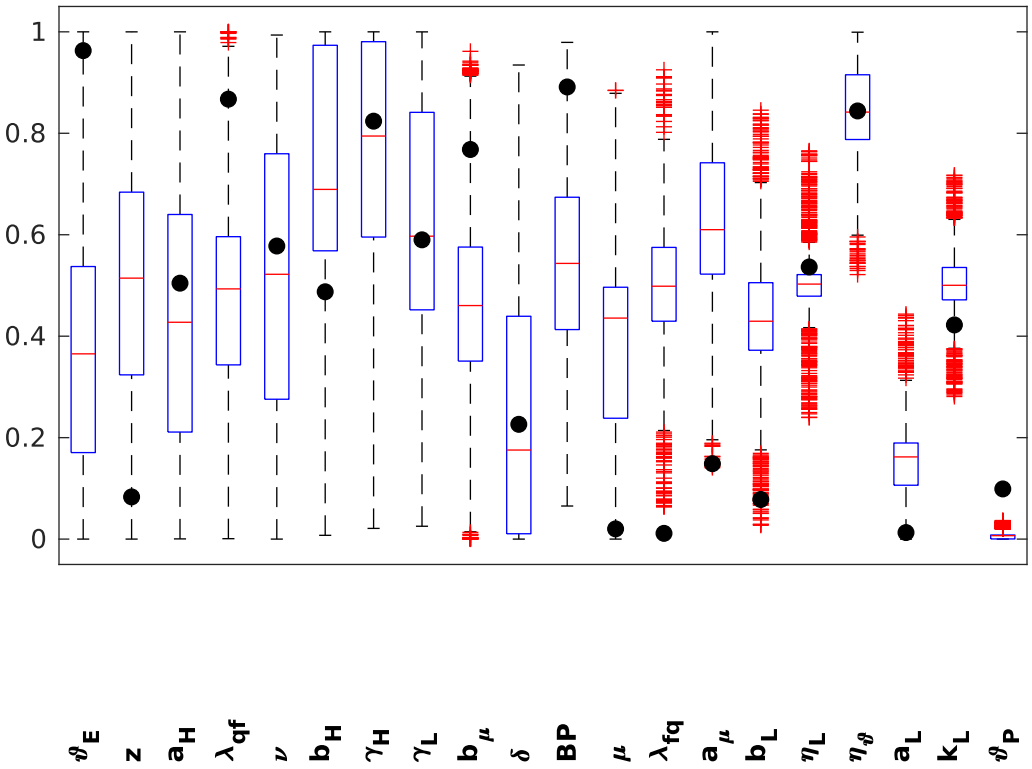
## 11.2. Estimated parameters with their intervals

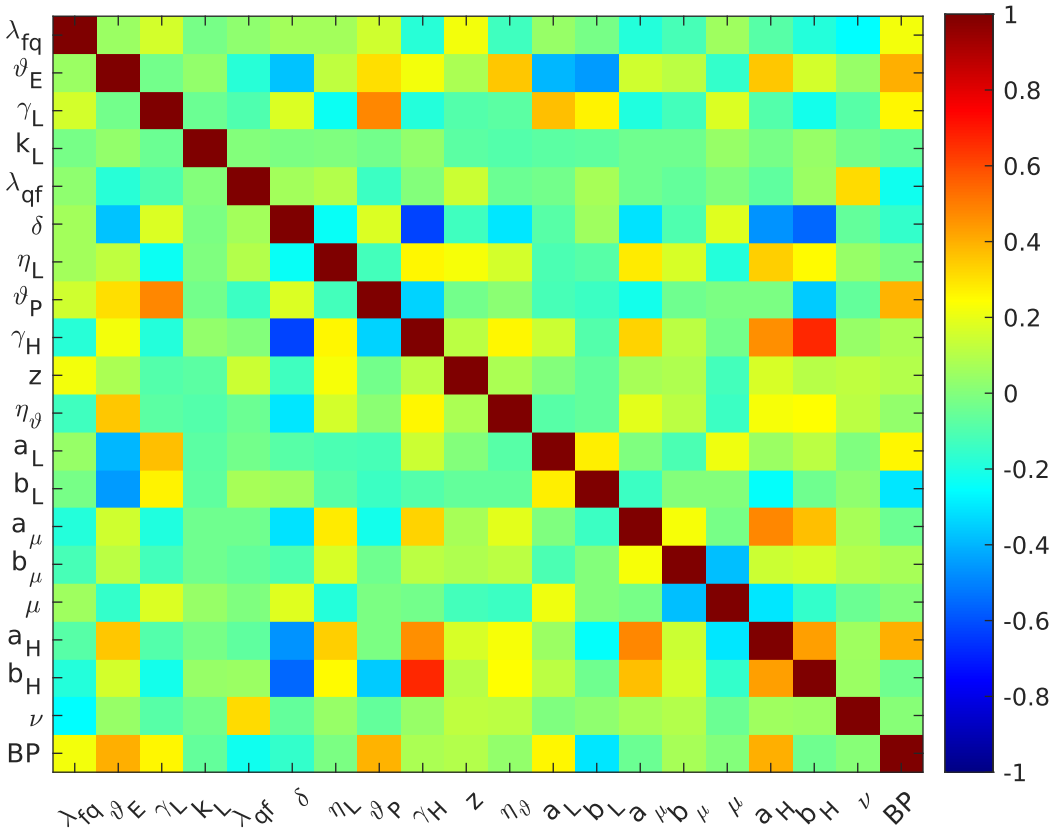
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

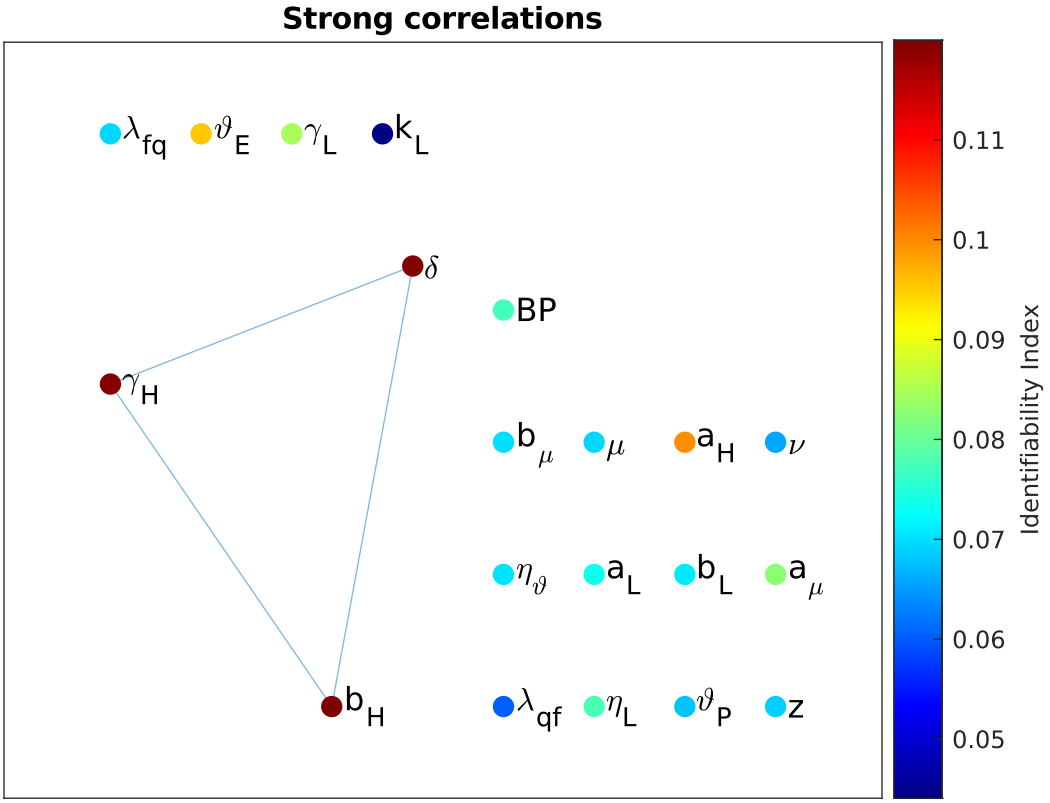
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0.0242' | '0.4985' | '0.0113' | '0.0694' |
| **\vartheta_E** | '0.4667' | '1' | '0.3652' | '0.9629' | '0.0956' |
| **\gamma_L** | '0.4667' | '0.5929' | '0.5971' | '0.59' | '0.0848' |
| **k_L** | '1' | '10' | '5.5031' | '4.7998' | '0.0441' |
| **\lambda_{qf}** | '0.0823' | '1' | '0.4932' | '0.8673' | '0.0605' |
| **\delta** | '0.0038' | '0.0764' | '0.0264' | '0.0339' | '0.1194' |
| **\eta_L** | '0.02' | '1' | '0.5027' | '0.5364' | '0.0781' |
| **\vartheta_P** | '0.0802' | '0.2227' | '0.0068' | '0.0989' | '0.068' |
| **\gamma_H** | '0' | '0.855' | '0.7946' | '0.8239' | '0.1194' |
| **z** | '0' | '5.0547' | '15.4334' | '2.4962' | '0.0689' |
| **\eta_\vartheta** | '0.525' | '0.9805' | '0.8417' | '0.844' | '0.0704' |
| **a_L** | '1.1717' | '1.7403' | '3.2682' | '1.1805' | '0.0736' |
| **b_L** | '1.386' | '2.6377' | '7.0129' | '2.0933' | '0.0708' |
| **a_\mu** | '1' | '15' | '9.5392' | '3.0812' | '0.0828' |
| **b_\mu** | '1' | '15' | '7.4455' | '11.7527' | '0.0699' |
| **\mu** | '0' | '0.0435' | '0.4358' | '0.0201' | '0.0694' |
| **a_H** | '4.9899' | '15' | '6.9845' | '8.0632' | '0.0996' |
| **b_H** | '1' | '14.44' | '10.6512' | '7.8257' | '0.12' |
| **\nu** | '151.7445' | '500' | '261.0164' | '288.8846' | '0.066' |
| **BP** | '379.071' | '381.5156' | '373.5' | '381.5' | '0.0774' |

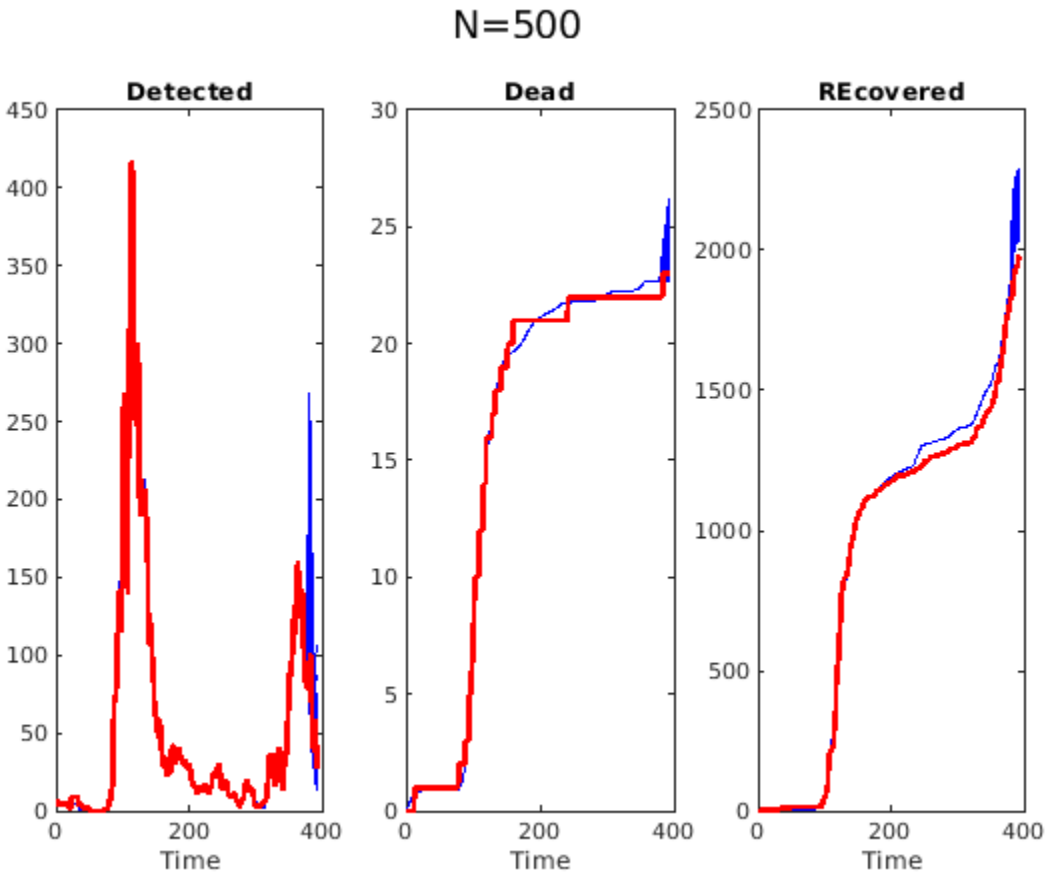
## 11.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\delta$
$\gamma_H$
$b_H$
BP
$b_\mu$
$\mu$
$a_H$
$\nu$
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$\lambda_{qf}$
$\eta_L$
$\vartheta_P$
z
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 11.4. Uncertainty analisys



# Chapter 12. Extension number12

## 12.1. Basic information

The extension to be validated consists of the time series from the data394 to the 403. The status of the validation is: COMPLETED.

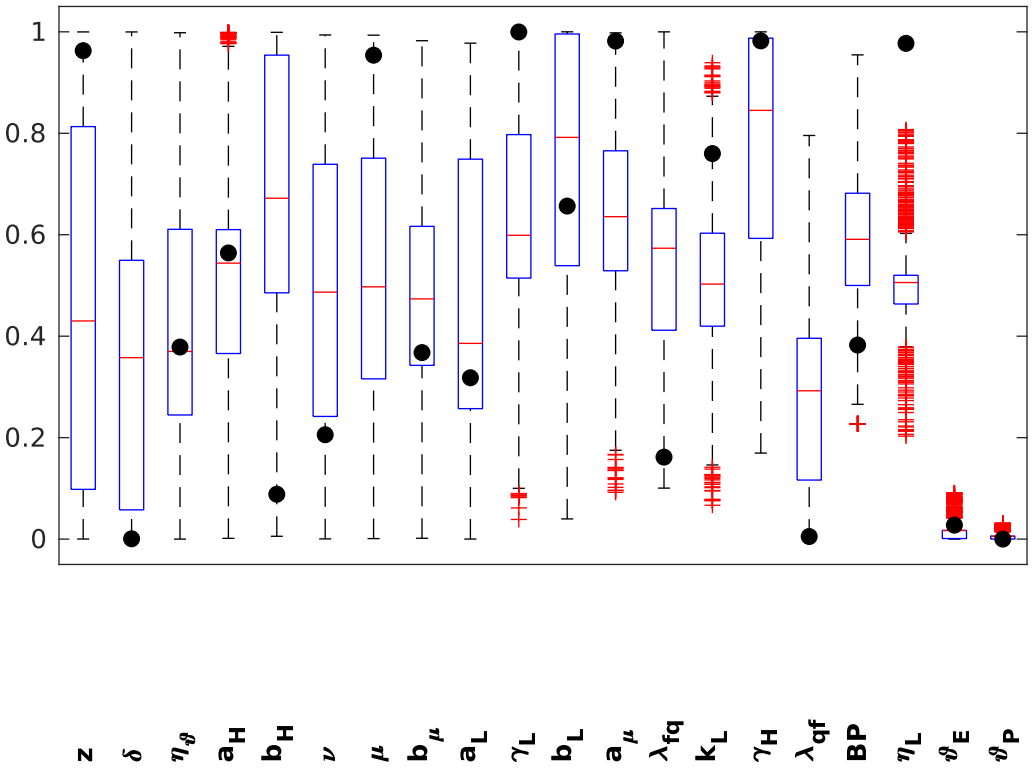
The number of estimations needed to perform the validation was1000.

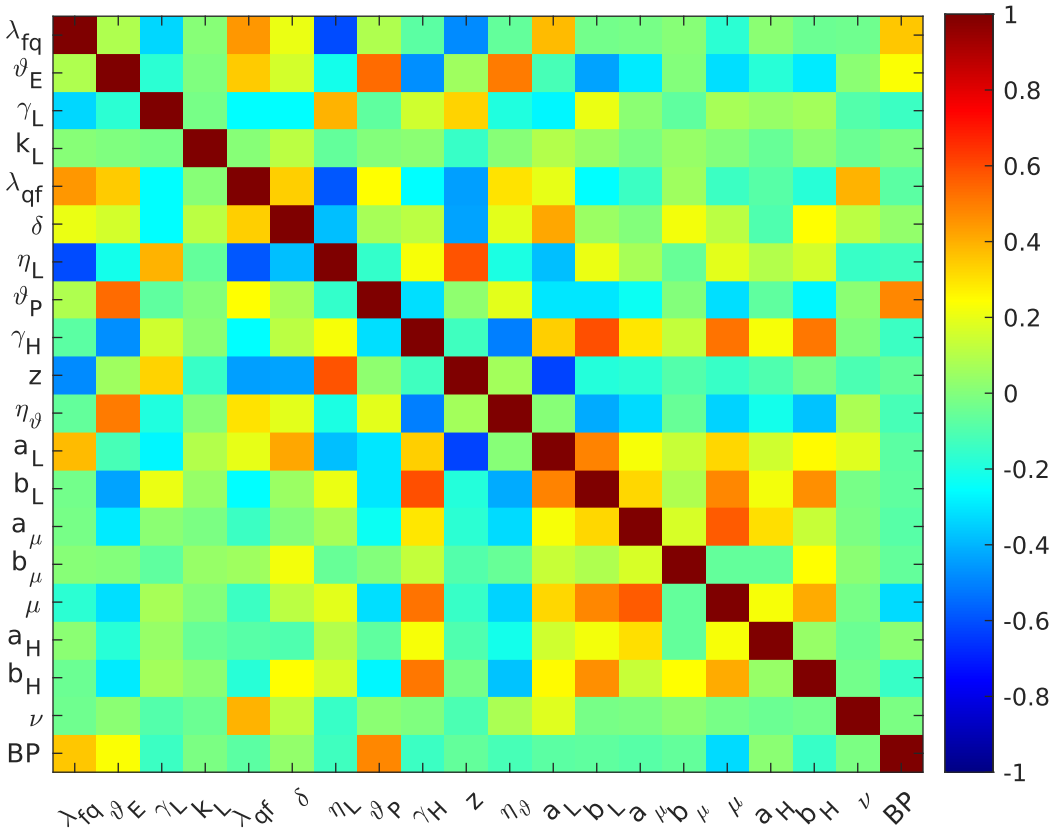
## 12.2. Estimated parameters with their intervals

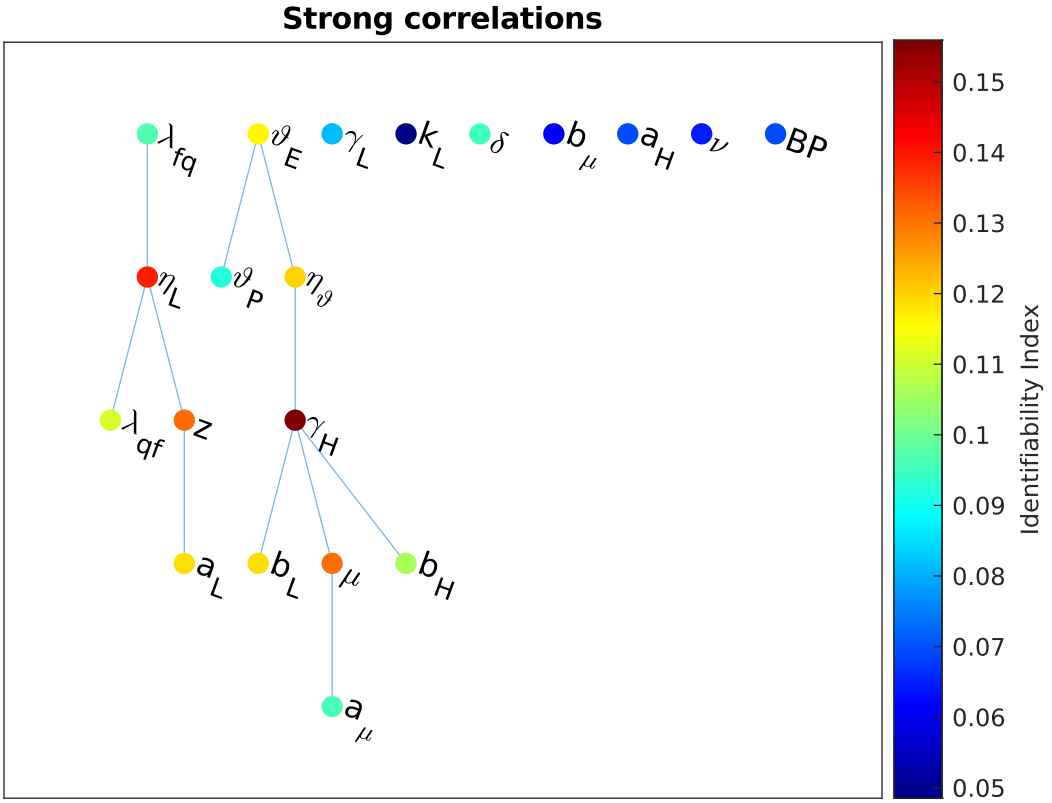
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.5567' | '0.5896' | '0.5731' | '0.1616' | '0.0971' |
| **\vartheta_E** | '0.0062' | '0.028' | '0.0171' | '0.0275' | '0.1163' |
| **\gamma_L** | '0.5814' | '0.6161' | '0.5987' | '0.9997' | '0.0815' |
| **k_L** | '5.3958' | '5.653' | '5.5244' | '7.8395' | '0.0485' |
| **\lambda_{qf}** | '0.2779' | '0.3069' | '0.2924' | '0.0051' | '0.1112' |
| **\delta** | '0.0498' | '0.0575' | '0.0536' | '0.0001' | '0.0954' |
| **\eta_L** | '0.4898' | '0.5218' | '0.5058' | '0.9773' | '0.1387' |
| **\vartheta_P** | '0' | '0.0176' | '0.0058' | '0.0001' | '0.0923' |
| **\gamma_H** | '0.8267' | '0.8628' | '0.8447' | '0.9821' | '0.1559' |
| **z** | '12.0455' | '13.757' | '12.9012' | '28.8841' | '0.1308' |
| **\eta_\vartheta** | '0.3516' | '0.3883' | '0.3699' | '0.3786' | '0.12' |
| **a_L** | '6.1373' | '6.6658' | '6.4015' | '5.453' | '0.1186' |
| **b_L** | '11.7967' | '12.3766' | '12.0867' | '10.1912' | '0.1189' |
| **a_\mu** | '9.6644' | '10.1171' | '9.8908' | '14.7461' | '0.0962' |
| **b_\mu** | '7.3989' | '7.8592' | '7.629' | '6.1473' | '0.0609' |
| **\mu** | '0.476' | '0.5186' | '0.4973' | '0.9539' | '0.1305' |
| **a_H** | '8.3824' | '8.8497' | '8.616' | '8.8976' | '0.0697' |
| **b_H** | '10.1248' | '10.6894' | '10.4071' | '2.2376' | '0.1063' |
| **\nu** | '232.2721' | '254.5687' | '243.4204' | '102.8578' | '0.0648' |
| **BP** | '388.3547' | '388.6452' | '388.5' | '386.2081' | '0.0699' |

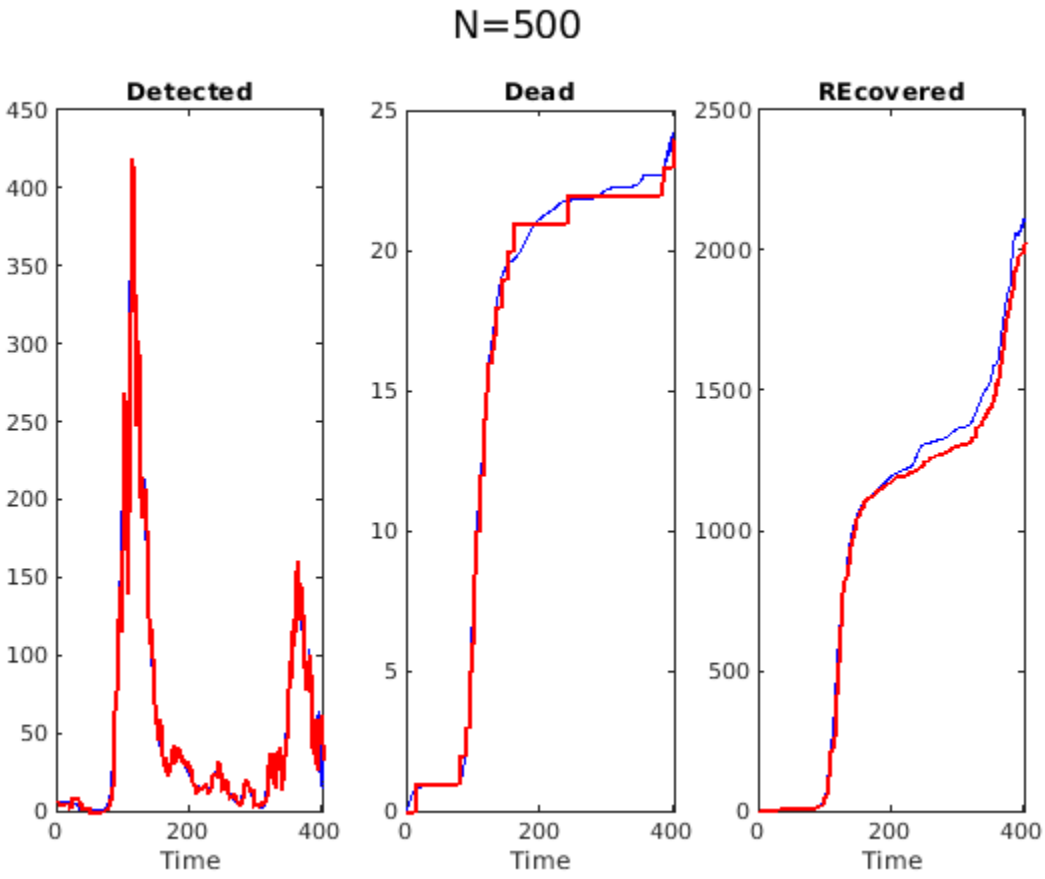
## 12.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\delta$
$b_\mu$
$a_H$
$\nu$
BP
$\eta_L$
$\vartheta_P$
$\eta_\vartheta$
$\lambda_{qf}$
z
$\gamma_H$
$a_L$
$b_L$
$\mu$
$b_H$
$a_\mu$
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 12.4. Uncertainty analisys



# Chapter 13. Extension number13

## 13.1. Basic information

The extension to be validated consists of the time series from the data403 to the 410. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

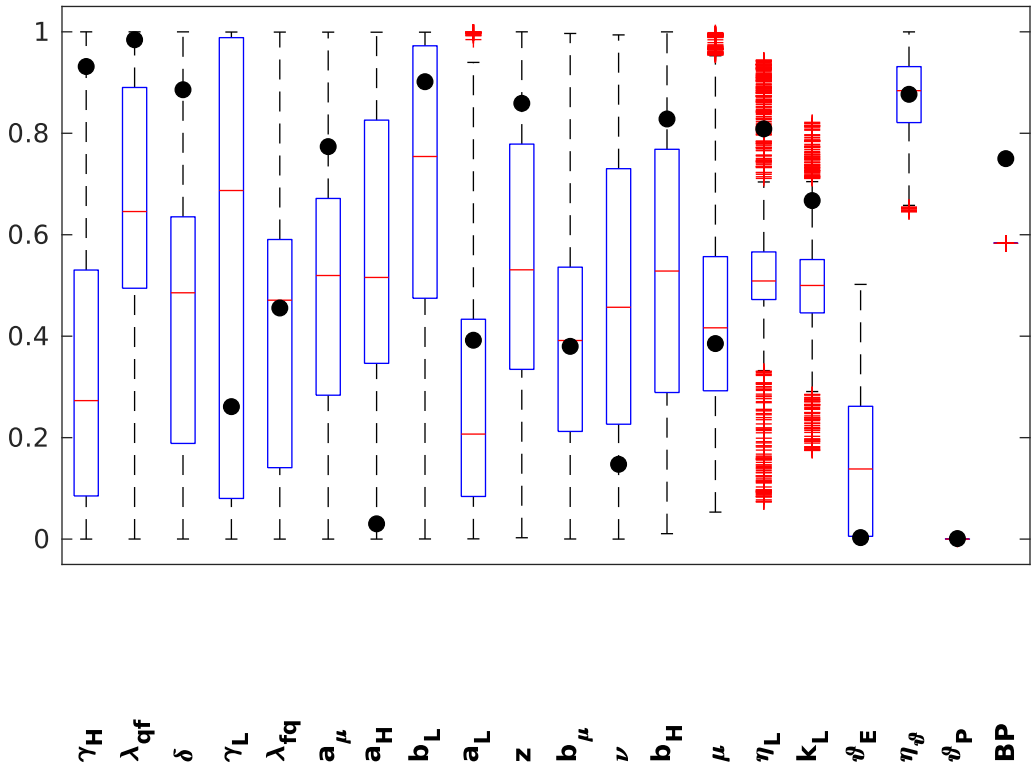
## 13.2. Estimated parameters with their intervals

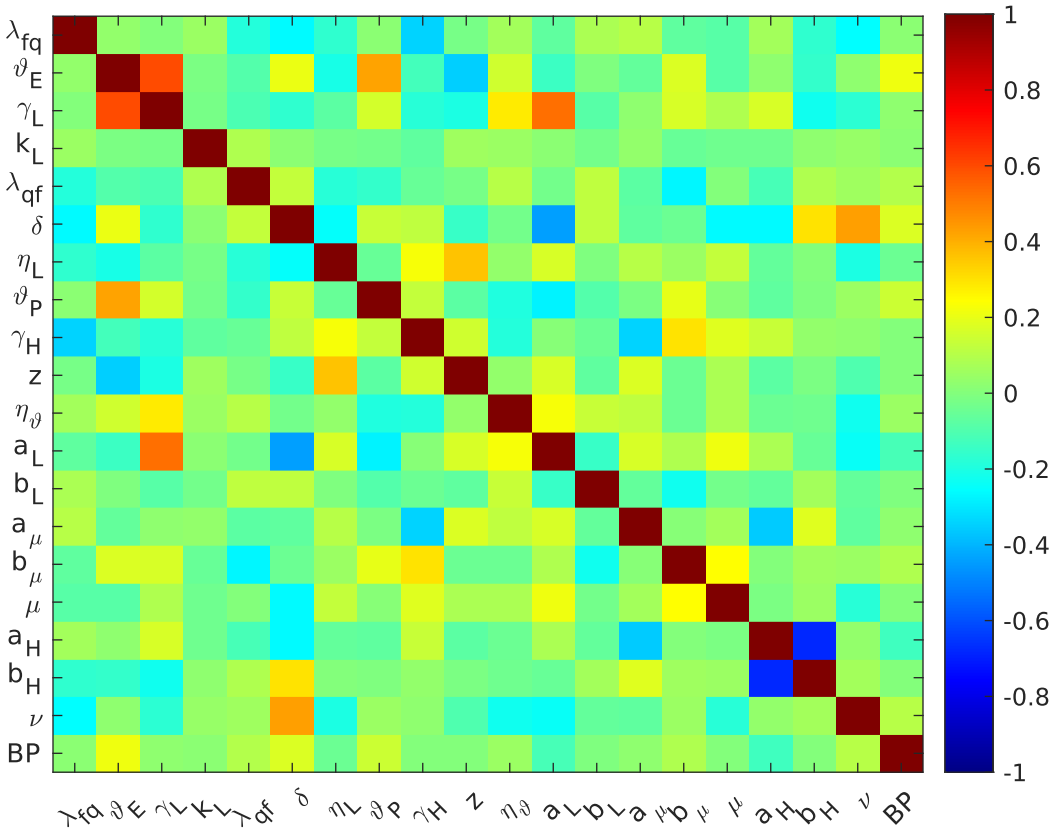
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

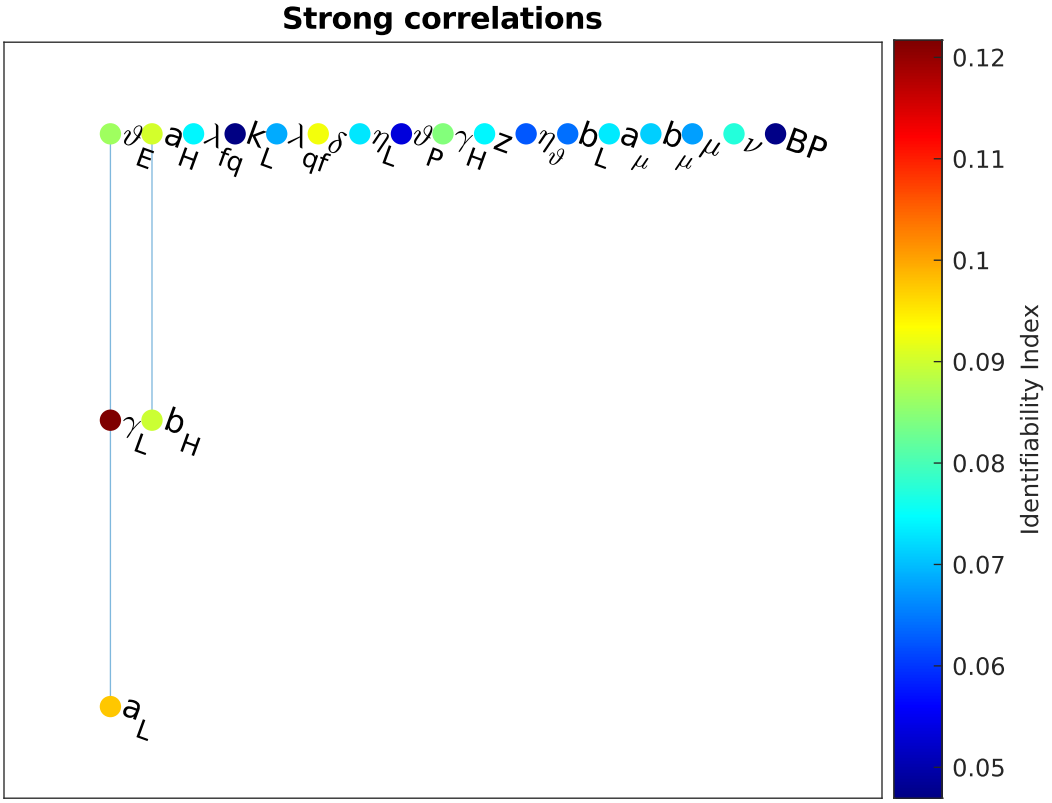
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.3277' | '0.9448' | '0.471' | '0.4556' | '0.0744' |
| **\vartheta_E** | '0' | '0.0064' | '0.1382' | '0.003' | '0.0864' |
| **\gamma_L** | '0.1787' | '0.2657' | '0.6872' | '0.2611' | '0.1217' |
| **k_L** | '1.18' | '10' | '5.4999' | '7.0058' | '0.047' |
| **\lambda_{qf}** | '0.8366' | '1' | '0.6457' | '0.9844' | '0.0686' |
| **\delta** | '0.0712' | '0.1466' | '0.0728' | '0.1329' | '0.0927' |
| **\eta_L** | '0.1259' | '1' | '0.5089' | '0.8087' | '0.0732' |
| **\vartheta_P** | '0.0009' | '0.002' | '0.0001' | '0.001' | '0.0535' |
| **\gamma_H** | '0.4562' | '0.9465' | '0.273' | '0.9316' | '0.0843' |
| **z** | '10.6014' | '27.9329' | '15.9252' | '25.7708' | '0.0744' |
| **\eta_\vartheta** | '0.7576' | '0.8784' | '0.8839' | '0.8768' | '0.0626' |
| **a_L** | '6.3586' | '7.9166' | '3.8983' | '6.4883' | '0.0977' |
| **b_L** | '10.6273' | '13.6979' | '11.5591' | '13.6235' | '0.0644' |
| **a_\mu** | '2.9127' | '13.9363' | '8.2747' | '11.8316' | '0.0735' |
| **b_\mu** | '1' | '13.768' | '6.4811' | '6.3194' | '0.0714' |
| **\mu** | '0' | '0.7118' | '0.4165' | '0.3854' | '0.0679' |
| **a_H** | '1.1124' | '2.441' | '8.2212' | '1.4221' | '0.0903' |
| **b_H** | '2.2183' | '15' | '8.3979' | '12.5945' | '0.0896' |
| **\nu** | '65.1671' | '110.0077' | '228.5009' | '73.7331' | '0.0776' |
| **BP** | '396.7118' | '399.8249' | '397.5' | '398.5' | '0.0475' |

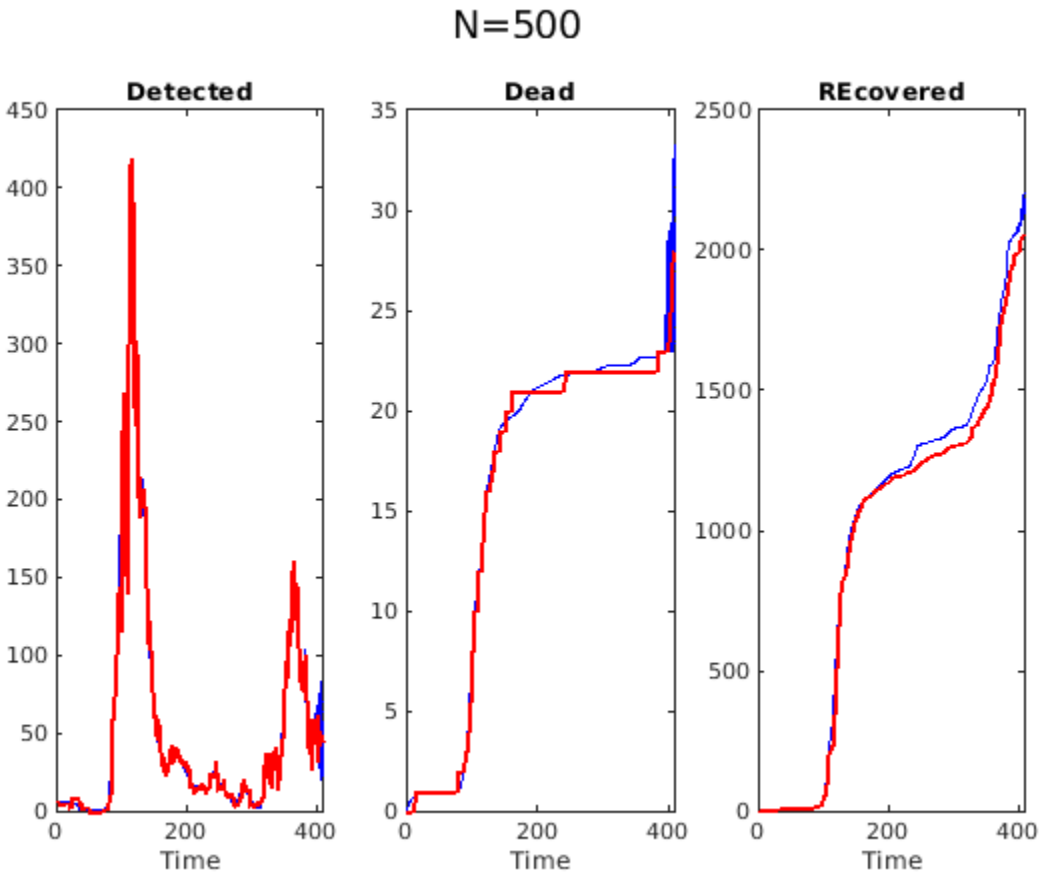
## 13.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$a_H$
$\lambda_{fq}$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
$z$
$\eta_\vartheta$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$\nu$
$BP$
$\gamma_L$
$b_H$
$a_L$
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 13.4. Uncertainty analisys



# Chapter 14. Extension number14

## 14.1. Basic information

The extension to be validated consists of the time series from the data410 to the 418. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

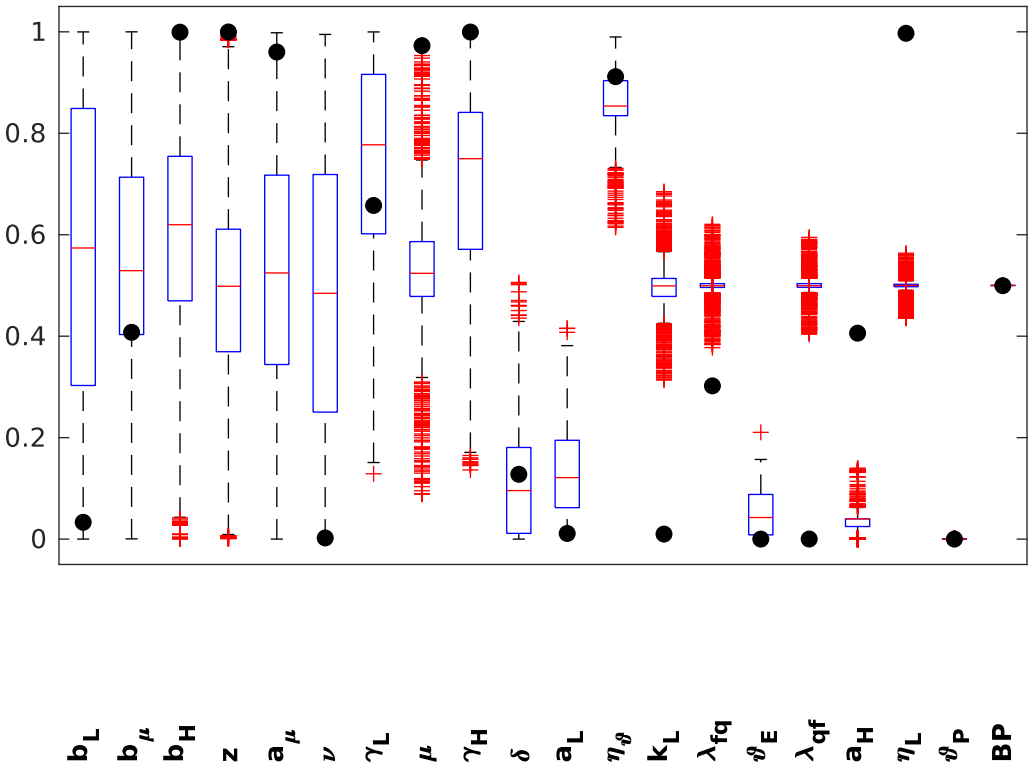
## 14.2. Estimated parameters with their intervals

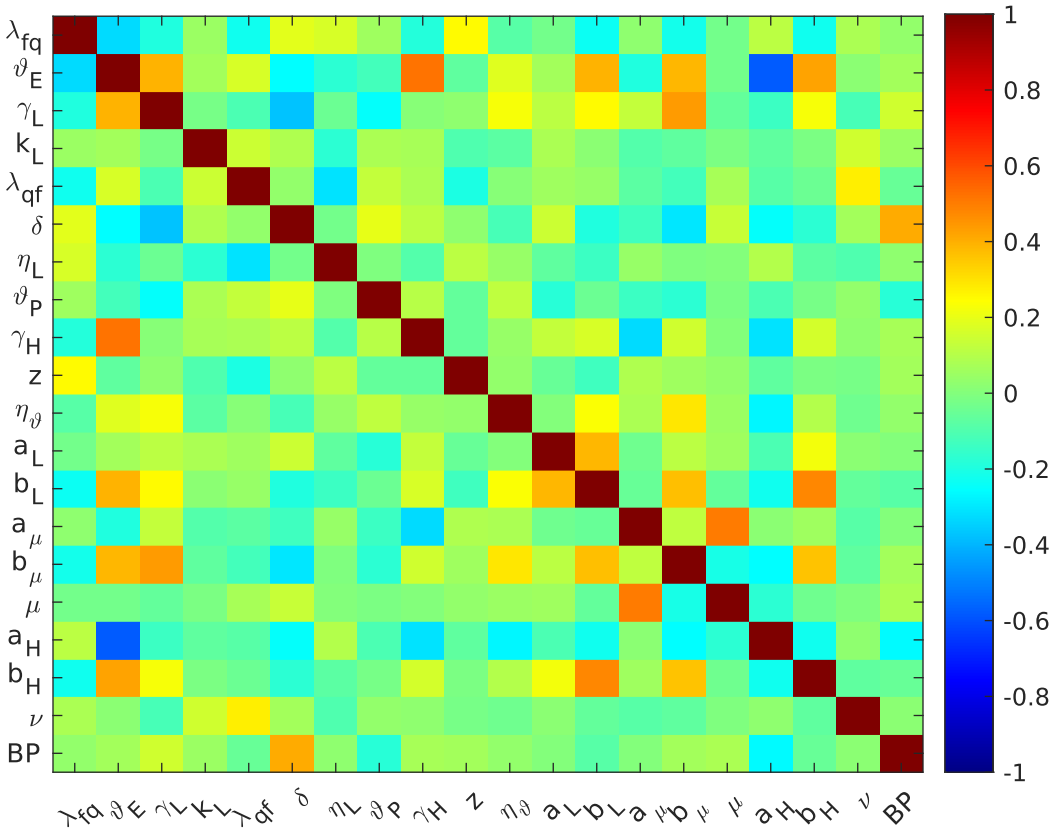
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

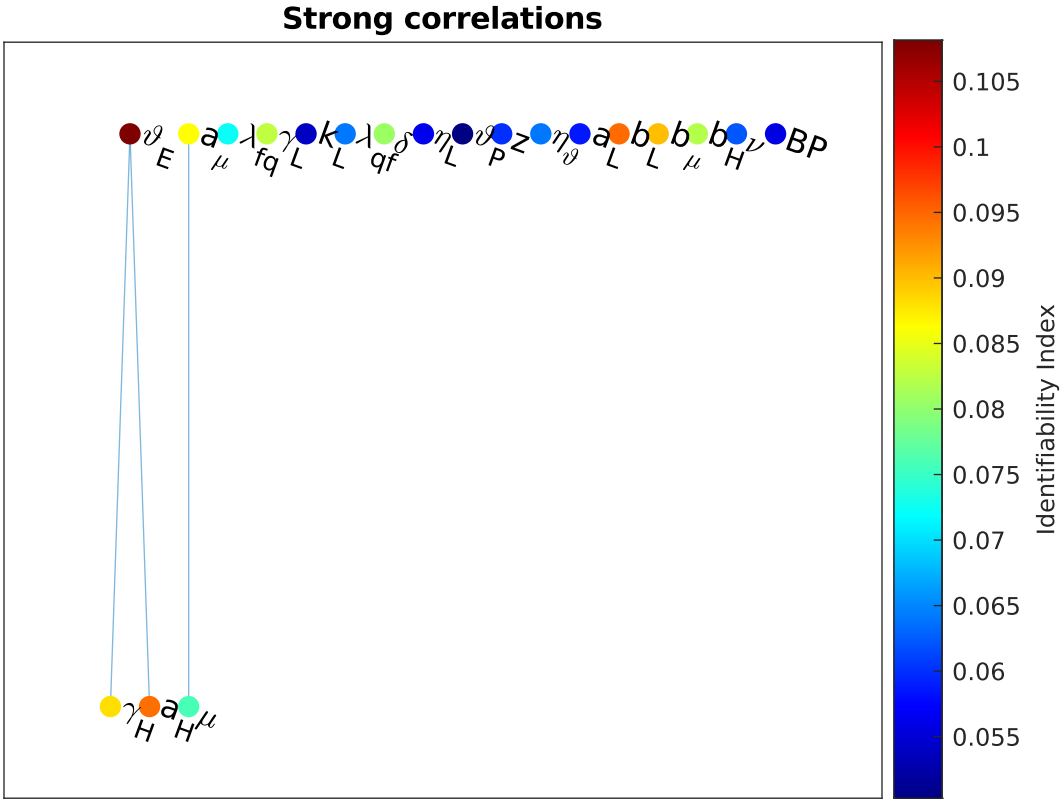
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.201' | '1' | '0.4994' | '0.3021' | '0.0724' |
| **\vartheta_E** | '0' | '0' | '0.0425' | '0' | '0.1081' |
| **\gamma_L** | '0.1111' | '0.9282' | '0.7768' | '0.6577' | '0.0826' |
| **k_L** | '1.0363' | '2.3938' | '5.4921' | '1.089' | '0.0539' |
| **\lambda_{qf}** | '0' | '0.0003' | '0.4996' | '0.0001' | '0.0642' |
| **\delta** | '0.0124' | '0.0228' | '0.0144' | '0.0192' | '0.0807' |
| **\eta_L** | '0' | '1' | '0.5' | '0.9971' | '0.0566' |
| **\vartheta_P** | '0' | '0' | '0.0003' | '0' | '0.0503' |
| **\gamma_H** | '0.4012' | '1' | '0.7498' | '0.9996' | '0.0883' |
| **z** | '9.9443' | '30' | '14.9527' | '29.99' | '0.0602' |
| **\eta_\vartheta** | '0.4583' | '1' | '0.8536' | '0.9116' | '0.0642' |
| **a_L** | '1.0937' | '4.7466' | '2.6972' | '1.1558' | '0.0588' |
| **b_L** | '1.2663' | '11.653' | '9.0344' | '1.4634' | '0.0947' |
| **a_\mu** | '7.3911' | '15' | '8.3456' | '14.4425' | '0.0863' |
| **b_\mu** | '1.1988' | '10.9387' | '8.4085' | '6.7069' | '0.09' |
| **\mu** | '0.1225' | '1' | '0.5239' | '0.9728' | '0.076' |
| **a_H** | '5.0261' | '6.8643' | '1.5588' | '6.6832' | '0.0945' |
| **b_H** | '10.0668' | '15' | '9.6763' | '14.9901' | '0.0821' |
| **\nu** | '0.0643' | '2.5728' | '242.2398' | '1.1435' | '0.0624' |
| **BP** | '404.1198' | '406.639' | '405.5' | '405.4978' | '0.0558' |

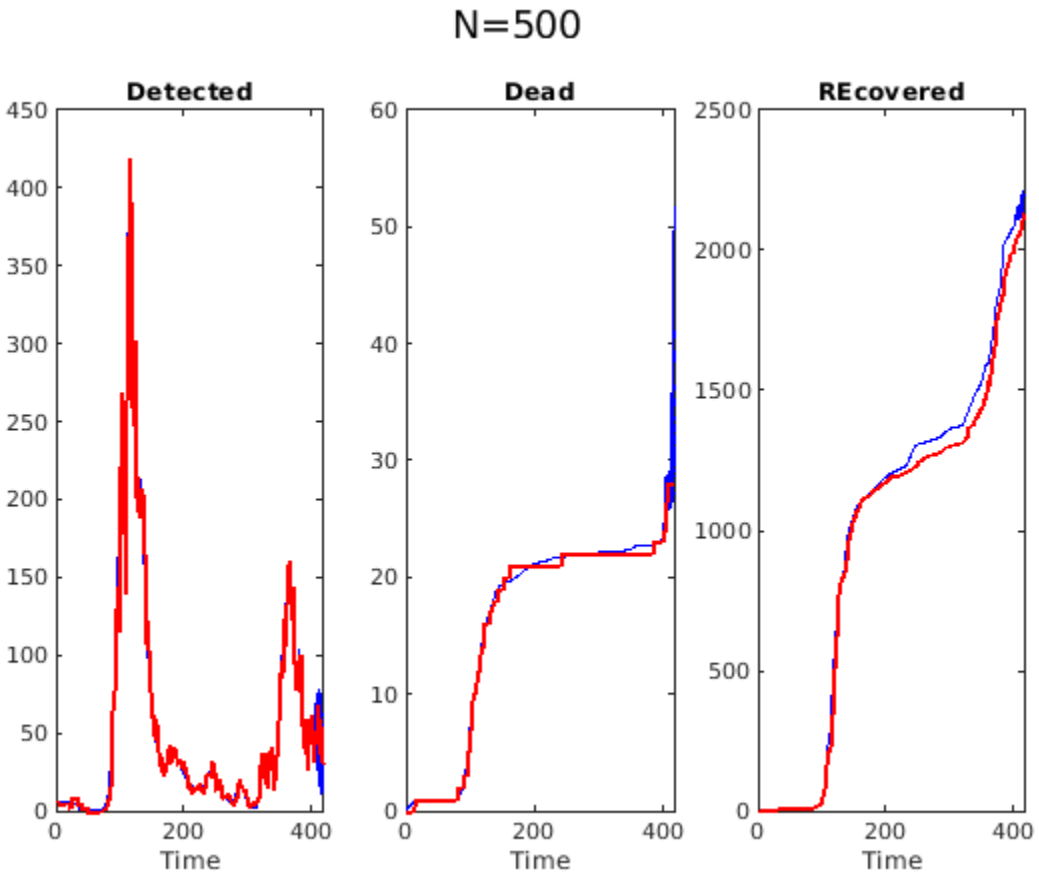
## 14.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.105
0.1
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055

## 14.4. Uncertainty analisys



# Chapter 15. Extension number15

## 15.1. Basic information

The extension to be validated consists of the time series from the data418 to the 425. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

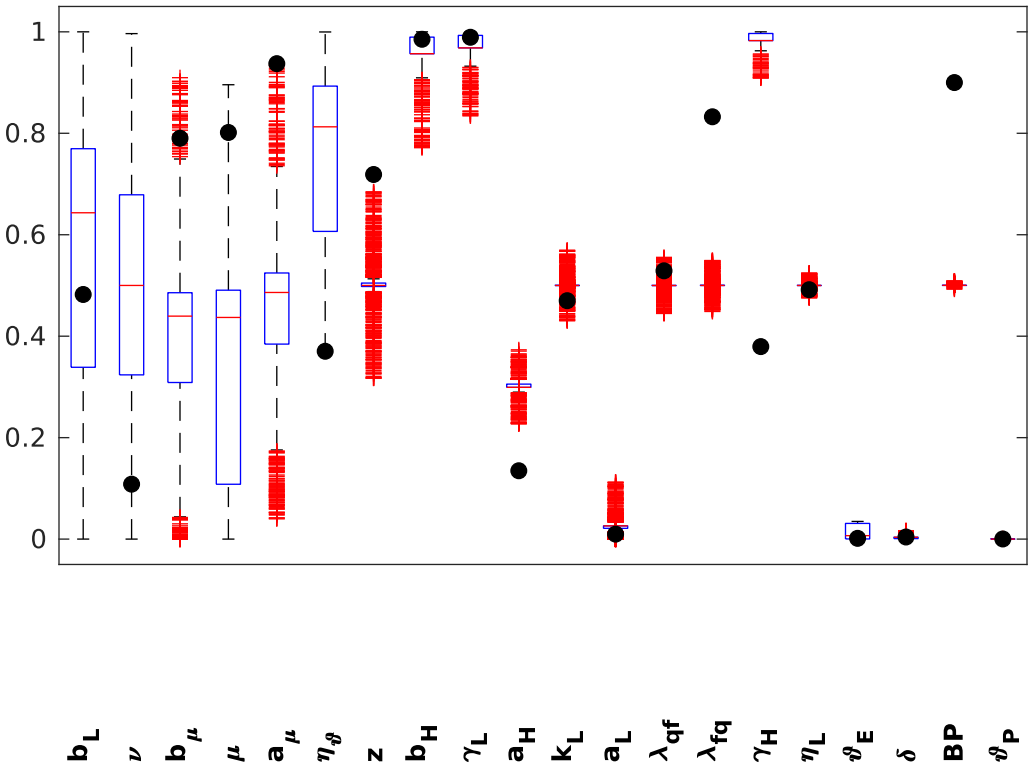
## 15.2. Estimated parameters with their intervals

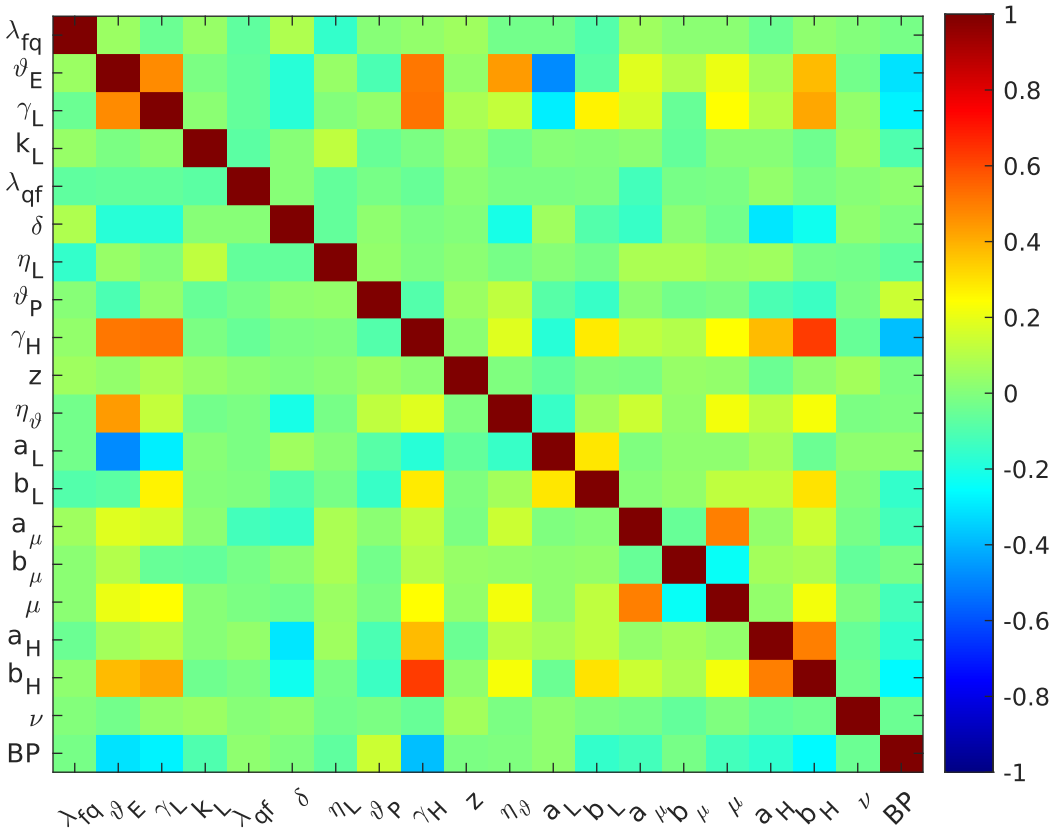
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

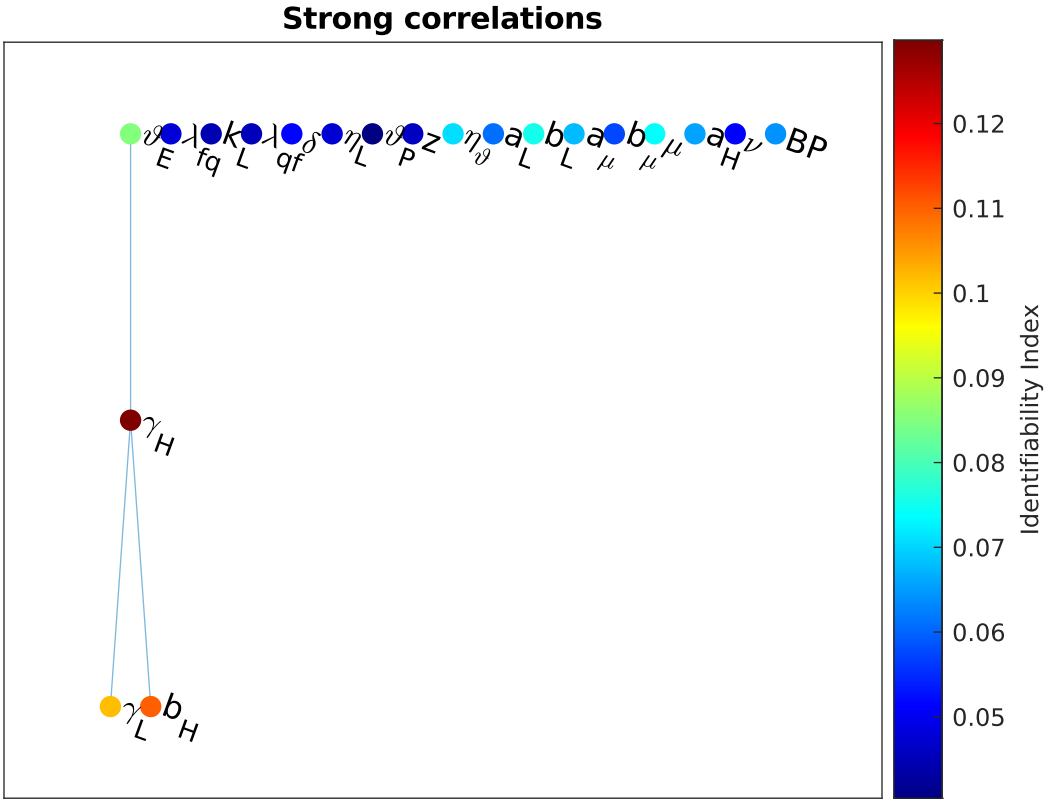
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.04' | '1' | '0.5001' | '0.8325' | '0.0479' |
| **\vartheta_E** | '0.0003' | '0.0034' | '0.0068' | '0.0015' | '0.0853' |
| **\gamma_L** | '0.8322' | '0.992' | '0.9683' | '0.9893' | '0.1018' |
| **k_L** | '1' | '10' | '5.5001' | '5.2297' | '0.0447' |
| **\lambda_{qf}** | '0.024' | '0.96' | '0.5' | '0.5289' | '0.0456' |
| **\delta** | '0.0001' | '0.0014' | '0.0006' | '0.0006' | '0.0517' |
| **\eta_L** | '0.0681' | '0.9525' | '0.5' | '0.4916' | '0.0477' |
| **\vartheta_P** | '0.0003' | '0.001' | '0.0001' | '0.0003' | '0.0404' |
| **\gamma_H** | '0.3352' | '0.5498' | '0.9827' | '0.3795' | '0.1298' |
| **z** | '0.75' | '30' | '15.0003' | '21.563' | '0.0461' |
| **\eta_\vartheta** | '0.3645' | '0.4499' | '0.8127' | '0.3703' | '0.0709' |
| **a_L** | '1.0525' | '1.5034' | '1.3653' | '1.1372' | '0.0613' |
| **b_L** | '4.5702' | '10.8951' | '10.0063' | '7.7513' | '0.0754' |
| **a_\mu** | '7.3218' | '14.2181' | '7.8066' | '14.1216' | '0.0677' |
| **b_\mu** | '1.7217' | '12.3904' | '7.154' | '12.0633' | '0.0578' |
| **\mu** | '0' | '0.9' | '0.437' | '0.8016' | '0.074' |
| **a_H** | '2.2385' | '4.1948' | '5.1883' | '2.8864' | '0.0656' |
| **b_H** | '9.373' | '15' | '14.3951' | '14.7947' | '0.1102' |
| **\nu** | '45.1877' | '481.8075' | '250.0162' | '54.1512' | '0.0513' |
| **BP** | '411.0071' | '414.8952' | '412.5014' | '414.5' | '0.0643' |

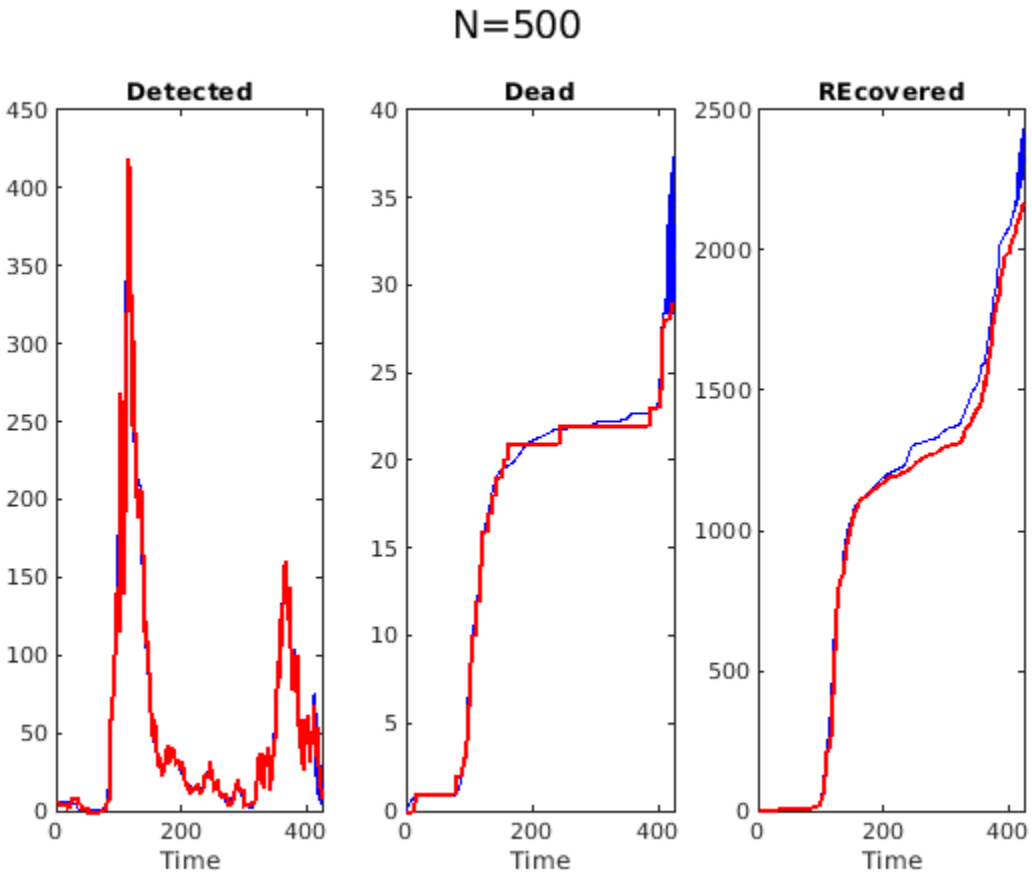
## 15.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$\lambda_{fq}$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$z$
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$\nu$
$BP$
$\gamma_H$
$\gamma_L$
$b_H$
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 15.4. Uncertainty analisys



# Chapter 16. Extension number16

## 16.1. Basic information

The extension to be validated consists of the time series from the data425 to the 439. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

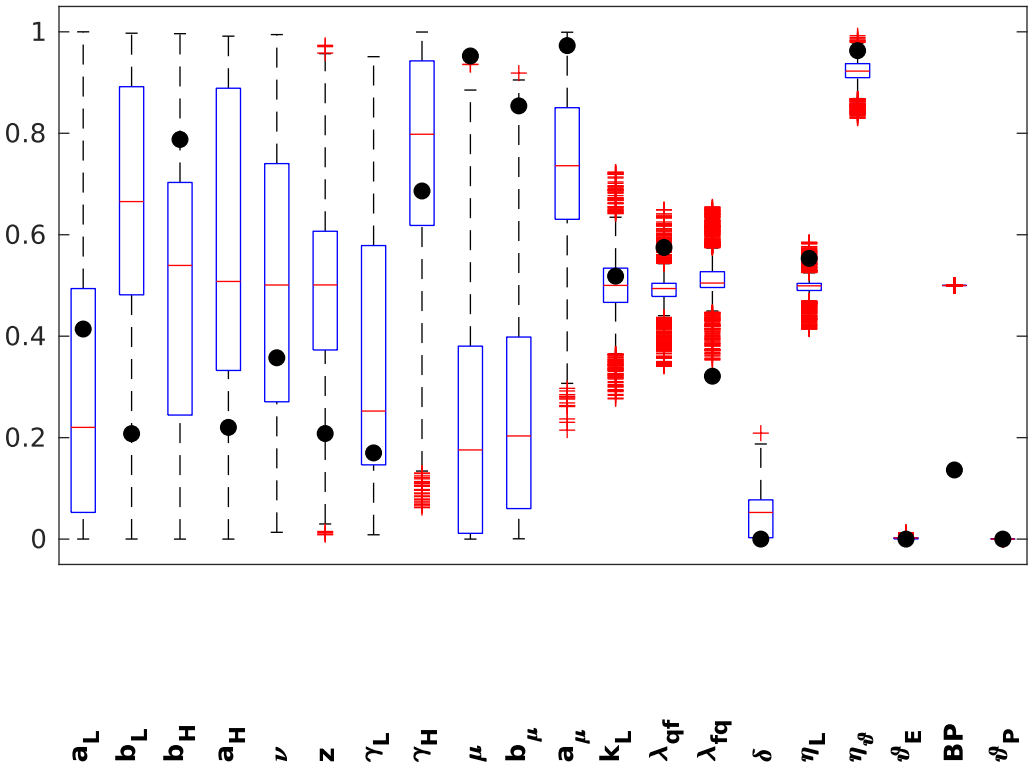
## 16.2. Estimated parameters with their intervals

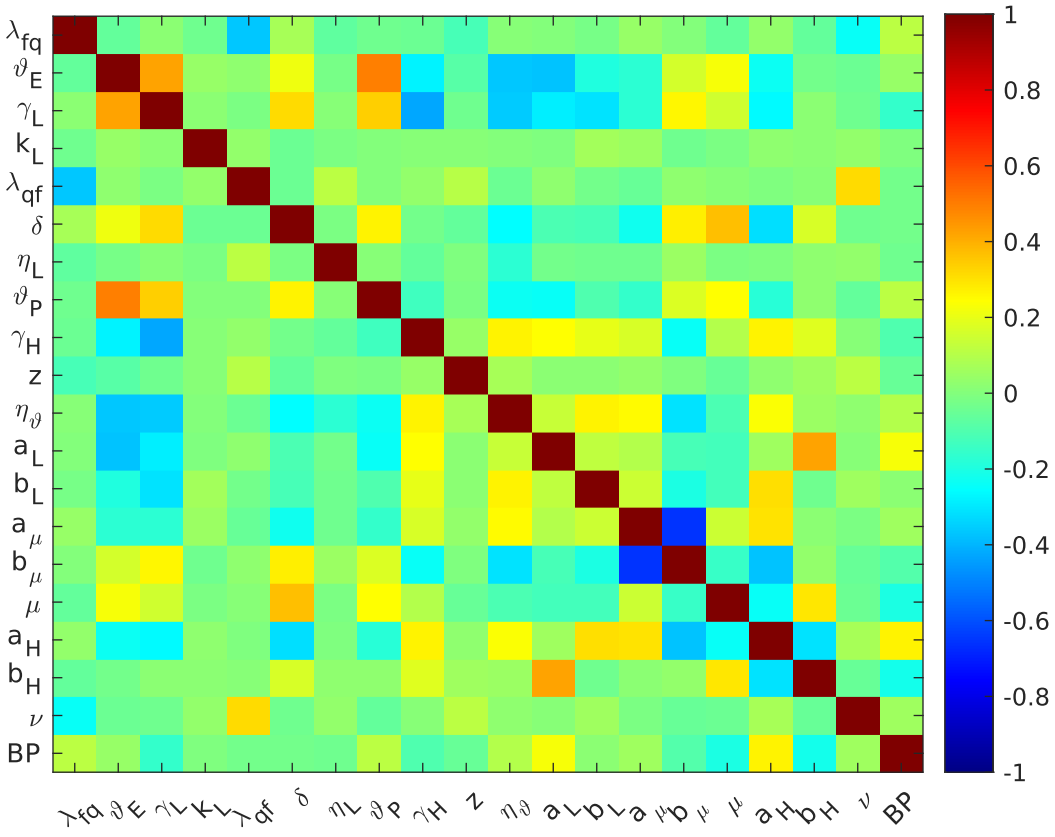
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

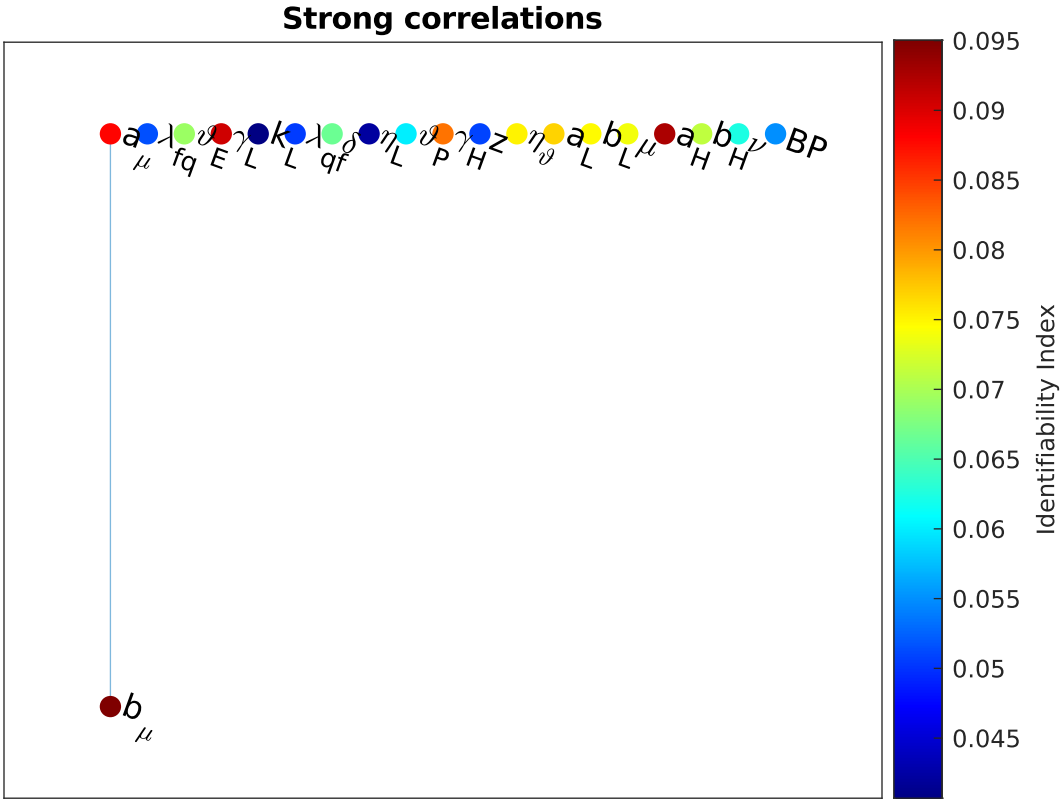
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0.7226' | '0.5048' | '0.3211' | '0.0517' |
| **\vartheta_E** | '0' | '0' | '0.0024' | '0' | '0.0692' |
| **\gamma_L** | '0.0189' | '0.3823' | '0.2528' | '0.1699' | '0.0908' |
| **k_L** | '1' | '10' | '5.501' | '5.6648' | '0.0407' |
| **\lambda_{qf}** | '0' | '1' | '0.4939' | '0.5749' | '0.0506' |
| **\delta** | '0' | '0' | '0.0079' | '0' | '0.0667' |
| **\eta_L** | '0' | '1' | '0.4993' | '0.5534' | '0.0422' |
| **\vartheta_P** | '0' | '0' | '0' | '0' | '0.06' |
| **\gamma_H** | '0.1252' | '1' | '0.7978' | '0.6862' | '0.082' |
| **z** | '0' | '14.049' | '15.031' | '6.244' | '0.0511' |
| **\eta_\vartheta** | '0.5784' | '1' | '0.9224' | '0.9629' | '0.0753' |
| **a_L** | '5.7202' | '15' | '4.0833' | '6.7973' | '0.077' |
| **b_L** | '1' | '8.6154' | '10.315' | '3.9105' | '0.0748' |
| **a_\mu** | '1' | '15' | '11.3024' | '14.6196' | '0.0879' |
| **b_\mu** | '1' | '15' | '3.849' | '12.9561' | '0.095' |
| **\mu** | '0' | '1' | '0.1768' | '0.9524' | '0.0739' |
| **a_H** | '1' | '10.2085' | '8.1108' | '4.0835' | '0.0926' |
| **b_H** | '2.642' | '15' | '8.5525' | '12.0297' | '0.0712' |
| **\nu** | '0' | '402.1495' | '250.4501' | '178.7331' | '0.0625' |
| **BP** | '419.4989' | '422.3795' | '423.5' | '419.4993' | '0.0549' |

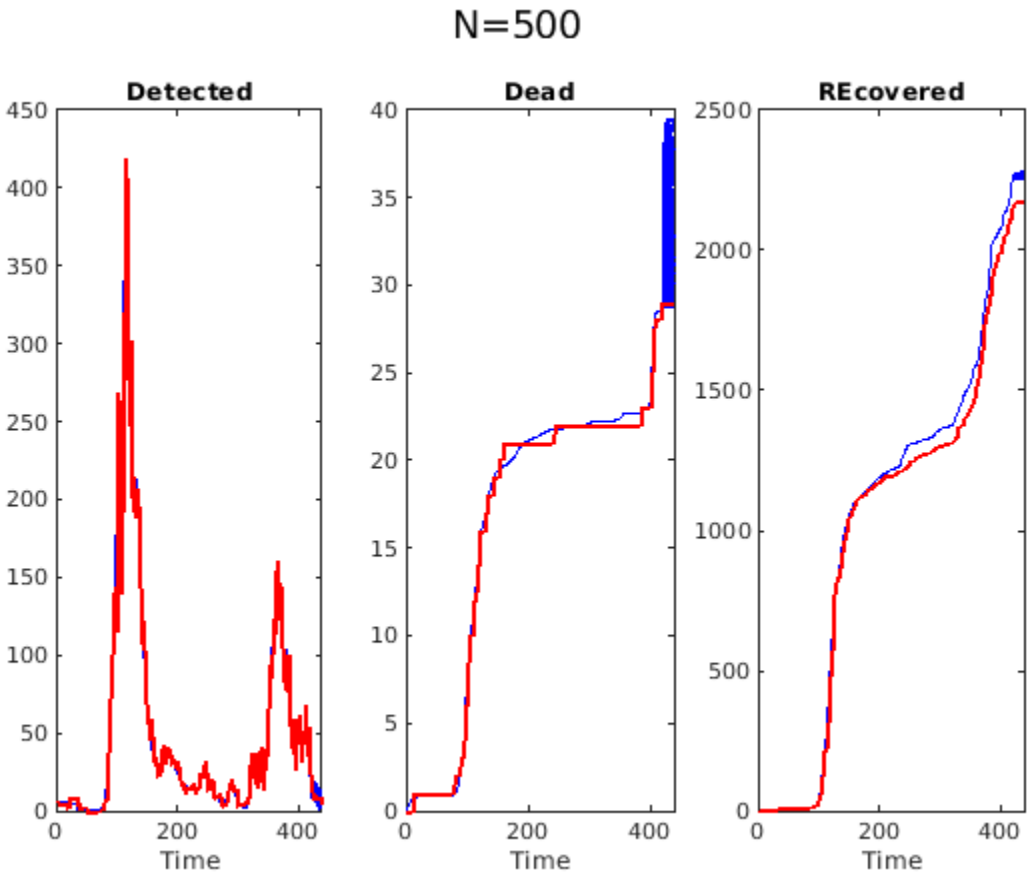
## 16.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0.045

## 16.4. Uncertainty analisys



# Chapter 17. Extension number17

## 17.1. Basic information

The extension to be validated consists of the time series from the data439 to the 450. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

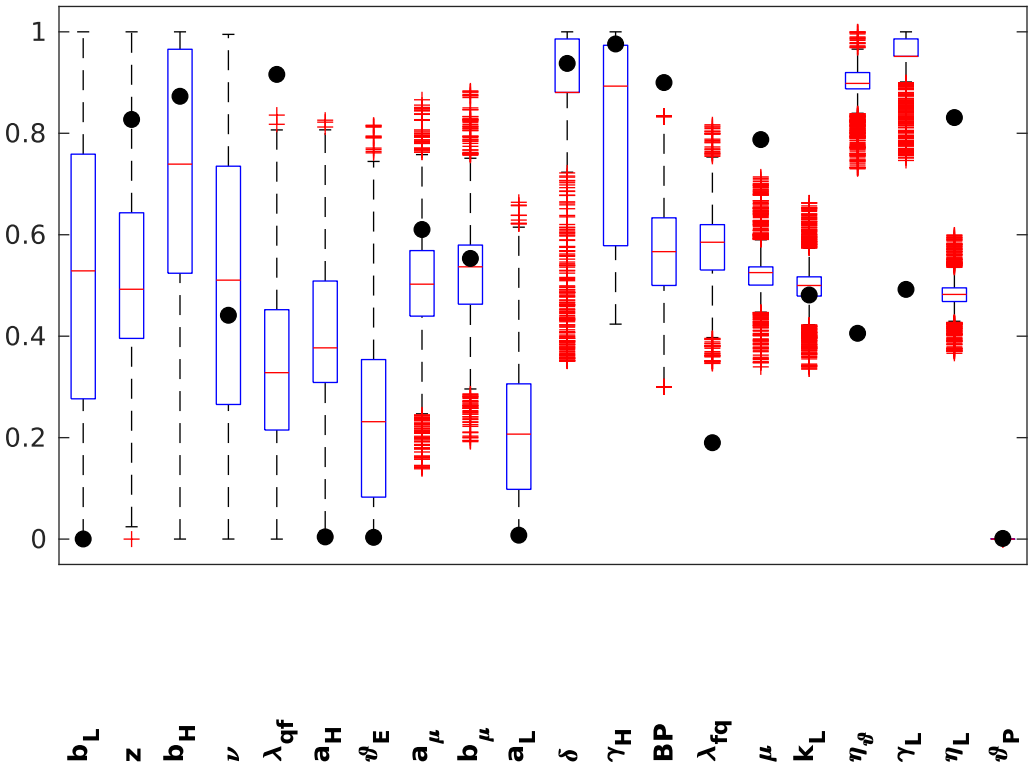
## 17.2. Estimated parameters with their intervals

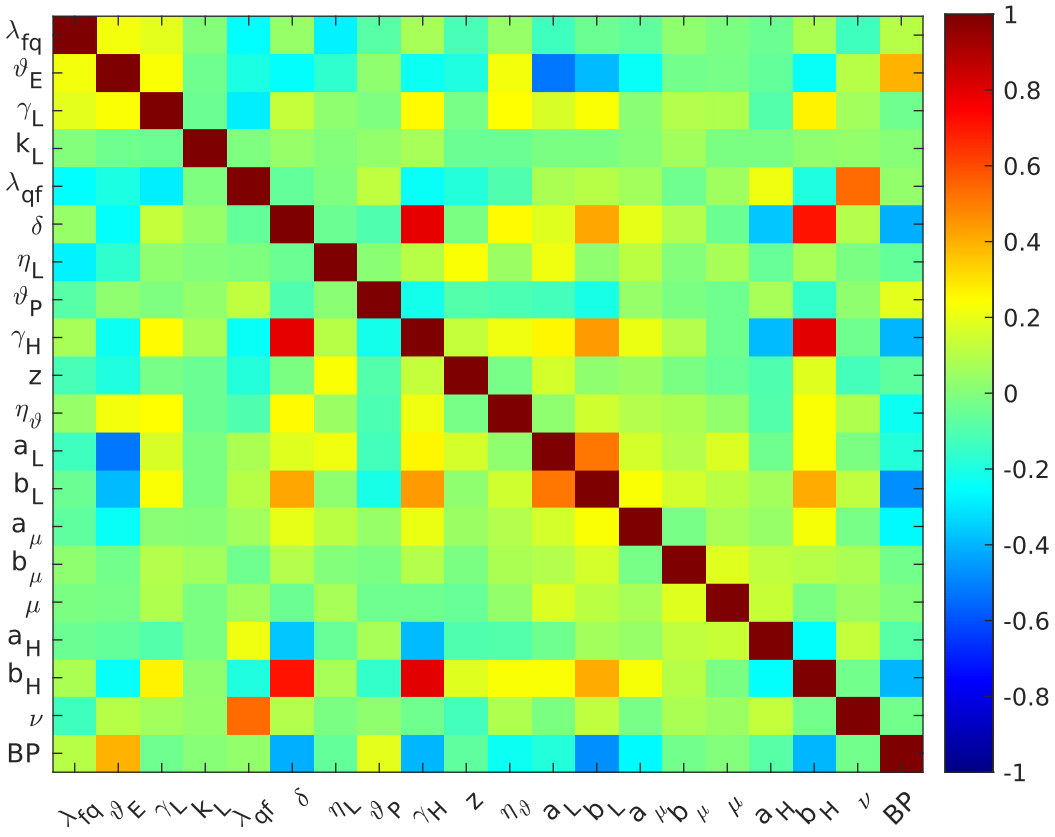
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

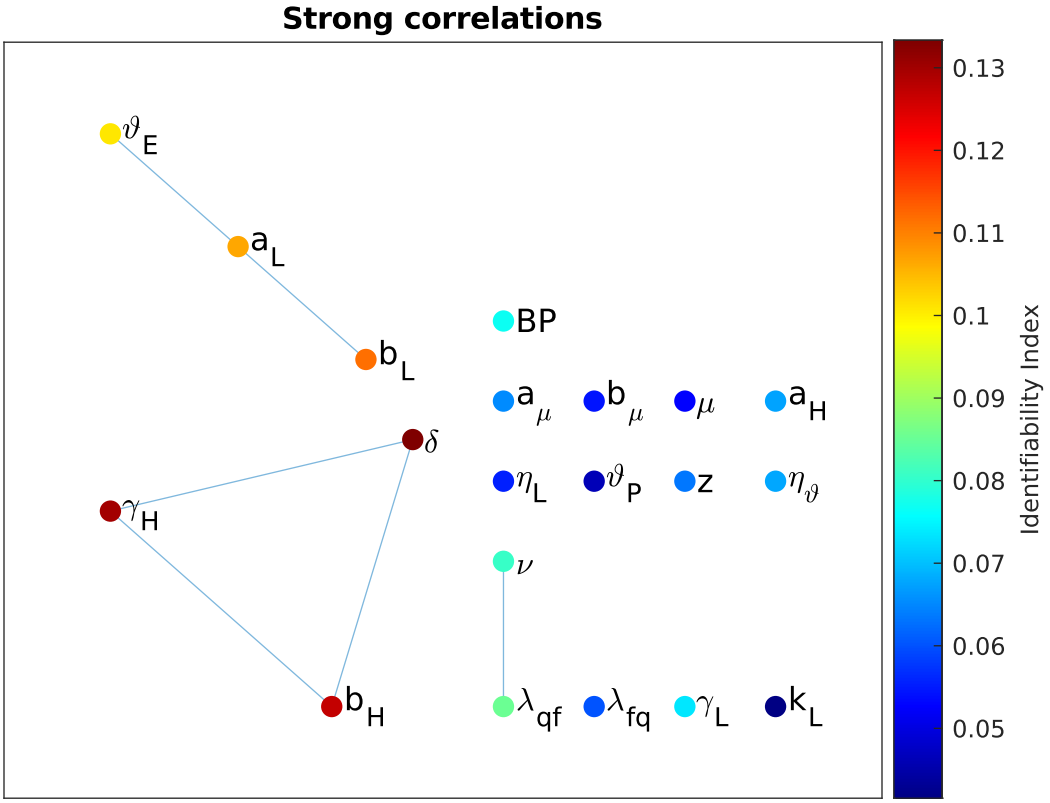
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.0107' | '0.4275' | '0.5852' | '0.19' | '0.0604' |
| **\vartheta_E** | '0' | '0.0071' | '0.2314' | '0.0035' | '0.1009' |
| **\gamma_L** | '0.4287' | '0.4938' | '0.9516' | '0.4923' | '0.0735' |
| **k_L** | '1' | '9.1225' | '5.4997' | '5.3311' | '0.0415' |
| **\lambda_{qf}** | '0' | '1' | '0.3281' | '0.9161' | '0.0853' |
| **\delta** | '0' | '0.15' | '0.1321' | '0.1407' | '0.1333' |
| **\eta_L** | '0' | '0.96' | '0.4823' | '0.831' | '0.0557' |
| **\vartheta_P** | '0.0013' | '0.0034' | '0.0001' | '0.0013' | '0.0462' |
| **\gamma_H** | '0' | '1' | '0.893' | '0.9761' | '0.1298' |
| **z** | '0' | '30' | '14.7758' | '24.8177' | '0.0635' |
| **\eta_\vartheta** | '0.405' | '0.4822' | '0.8983' | '0.4057' | '0.0679' |
| **a_L** | '1.0463' | '1.2794' | '3.8971' | '1.1081' | '0.1066' |
| **b_L** | '1' | '1.5412' | '8.4029' | '1.0033' | '0.1115' |
| **a_\mu** | '1.35' | '15' | '8.0356' | '9.5446' | '0.0655' |
| **b_\mu** | '1' | '13.6' | '8.5149' | '8.7461' | '0.0545' |
| **\mu** | '0' | '1' | '0.5254' | '0.7876' | '0.0527' |
| **a_H** | '1' | '15' | '6.2781' | '1.061' | '0.0675' |
| **b_H** | '1' | '15' | '11.3486' | '13.2211' | '0.1272' |
| **\nu** | '127.7875' | '500' | '255.2422' | '220.6295' | '0.0807' |
| **BP** | '437.4936' | '439.3' | '433.5' | '438.5' | '0.0768' |

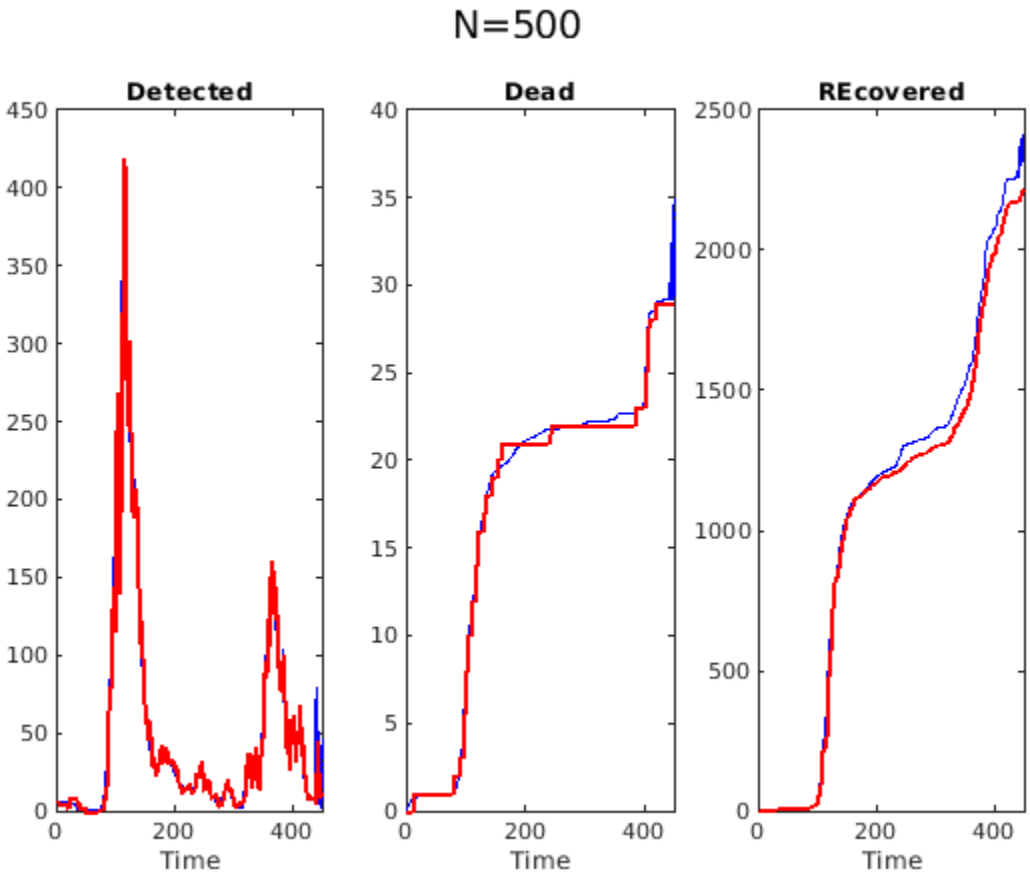
## 17.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$a_L$
$b_L$
$\delta$
$\gamma_H$
$b_H$
BP
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$\eta_L$
$\vartheta_P$
z
$\eta_\vartheta$
$\nu$
$\lambda_{qf}$
$\lambda_{fq}$
$\gamma_L$
$k_L$
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 17.4. Uncertainty analisys



# Chapter 18. Extension number18

## 18.1. Basic information

The extension to be validated consists of the time series from the data450 to the 463. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

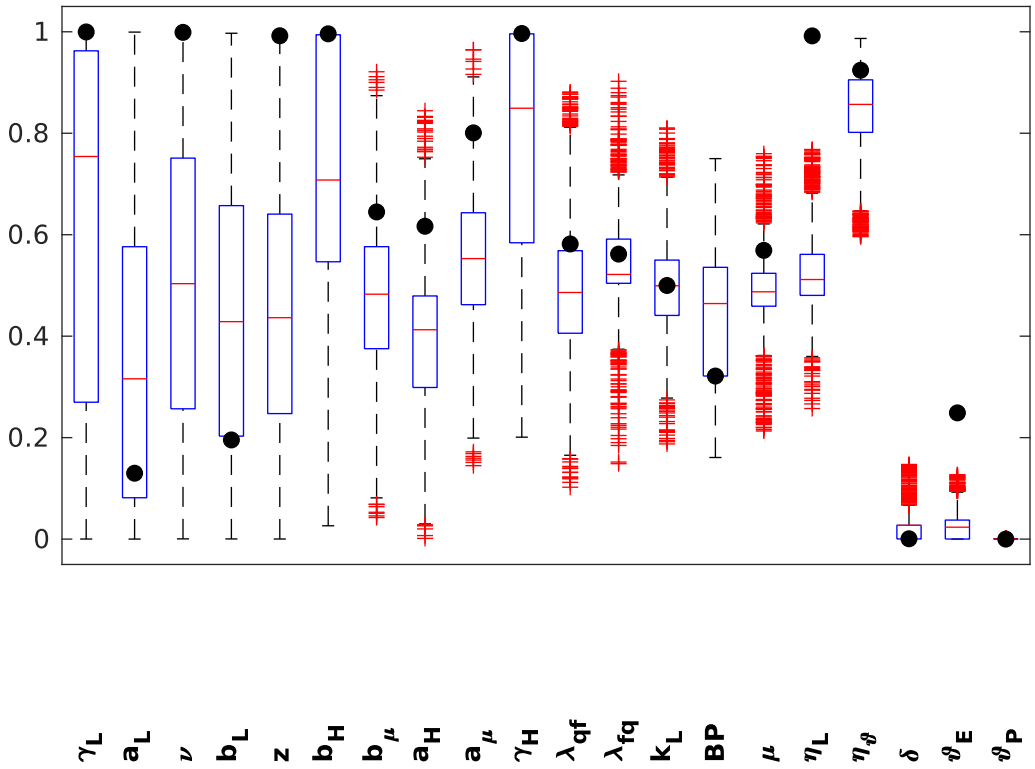
## 18.2. Estimated parameters with their intervals

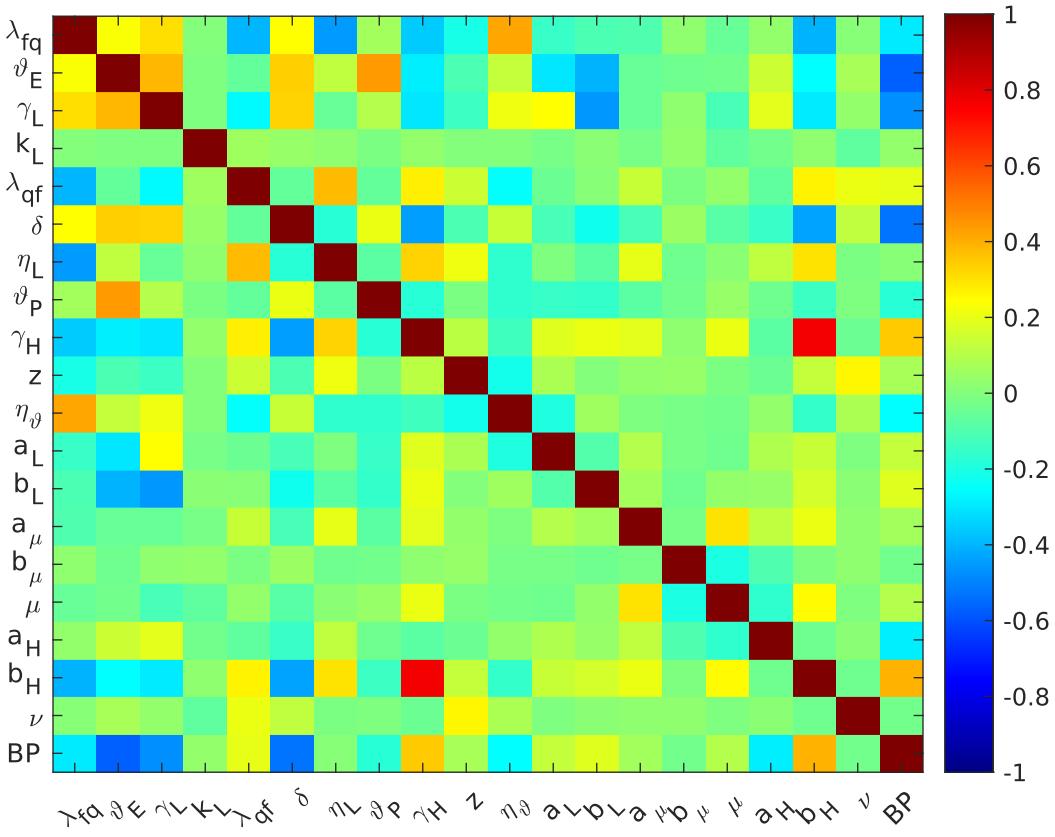
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

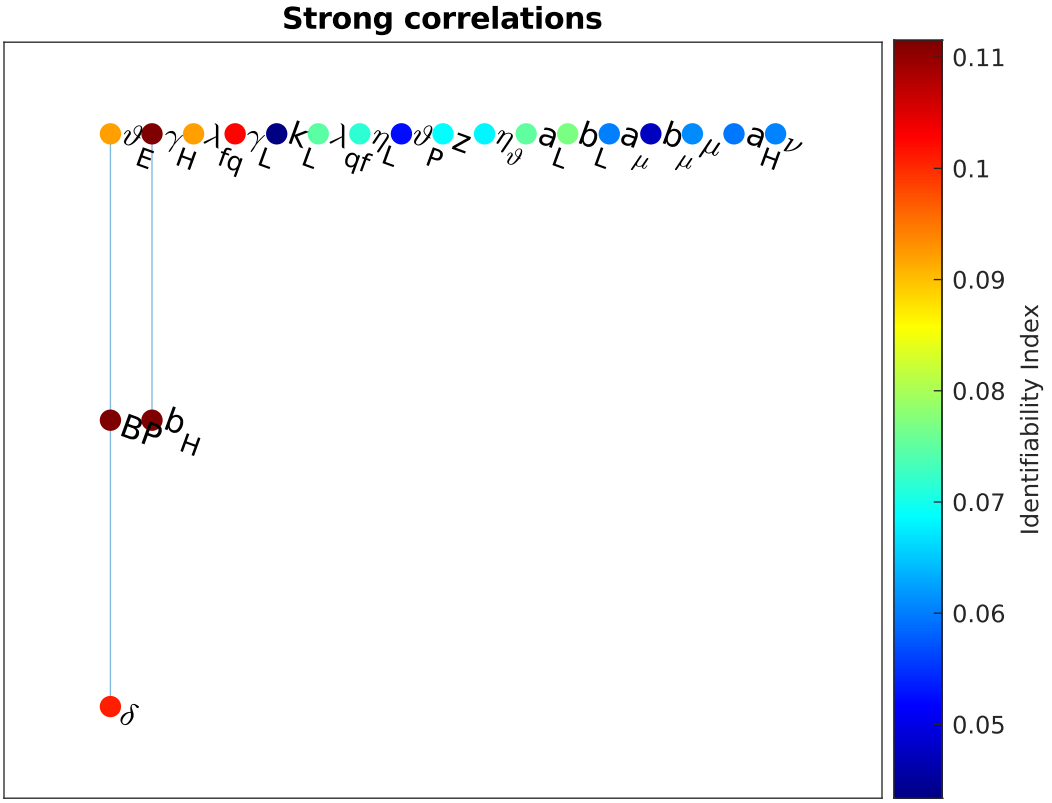
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.3895' | '1' | '0.5217' | '0.5618' | '0.0921' |
| **\vartheta_E** | '0.164' | '0.2545' | '0.0235' | '0.2488' | '0.0923' |
| **\gamma_L** | '0.5396' | '1' | '0.7542' | '0.9997' | '0.1025' |
| **k_L** | '1' | '10' | '5.4942' | '5.4992' | '0.0434' |
| **\lambda_{qf}** | '0' | '0.7125' | '0.4861' | '0.5818' | '0.0748' |
| **\delta** | '0' | '0.0002' | '0.0041' | '0.0001' | '0.1008' |
| **\eta_L** | '0' | '1' | '0.5117' | '0.9919' | '0.0716' |
| **\vartheta_P** | '0' | '0' | '0.0002' | '0' | '0.0525' |
| **\gamma_H** | '0' | '1' | '0.8493' | '0.9966' | '0.1113' |
| **z** | '0' | '30' | '13.0923' | '29.7643' | '0.0688' |
| **\eta_\vartheta** | '0.4018' | '1' | '0.8569' | '0.9242' | '0.0683' |
| **a_L** | '2.3223' | '3.3978' | '5.4236' | '2.8182' | '0.0752' |
| **b_L** | '1.5885' | '5.3269' | '7.0007' | '3.7366' | '0.0769' |
| **a_\mu** | '1' | '15' | '8.7408' | '12.2106' | '0.0603' |
| **b_\mu** | '1' | '15' | '7.7585' | '10.0283' | '0.0474' |
| **\mu** | '0' | '1' | '0.4875' | '0.5691' | '0.0611' |
| **a_H** | '1.35' | '15' | '6.7773' | '9.6331' | '0.0597' |
| **b_H** | '1' | '15' | '10.9093' | '14.9435' | '0.1115' |
| **\nu** | '356.0032' | '500' | '251.7478' | '499.435' | '0.0605' |
| **BP** | '443.4925' | '443.4998' | '445.5' | '443.4997' | '0.1115' |

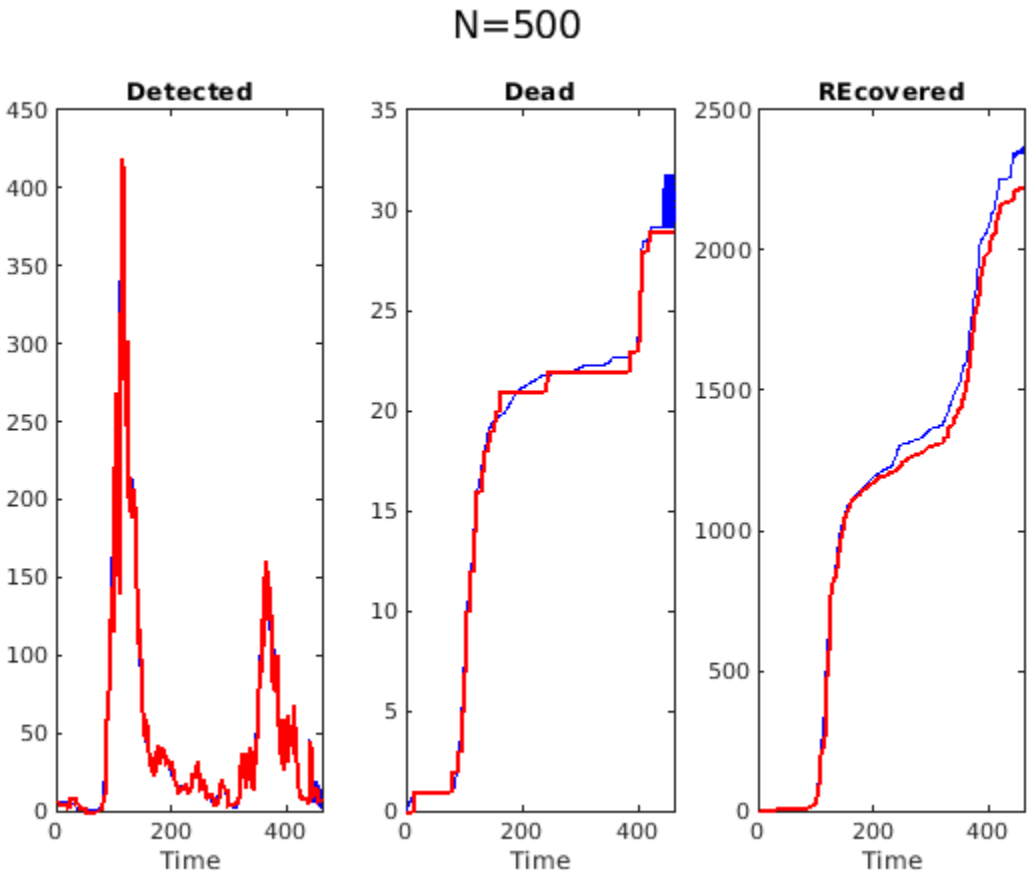
## 18.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 18.4. Uncertainty analisys



# Chapter 19. Extension number19

## 19.1. Basic information

The extension to be validated consists of the time series from the data463 to the 463. The status of the validation is: COMPLETED.

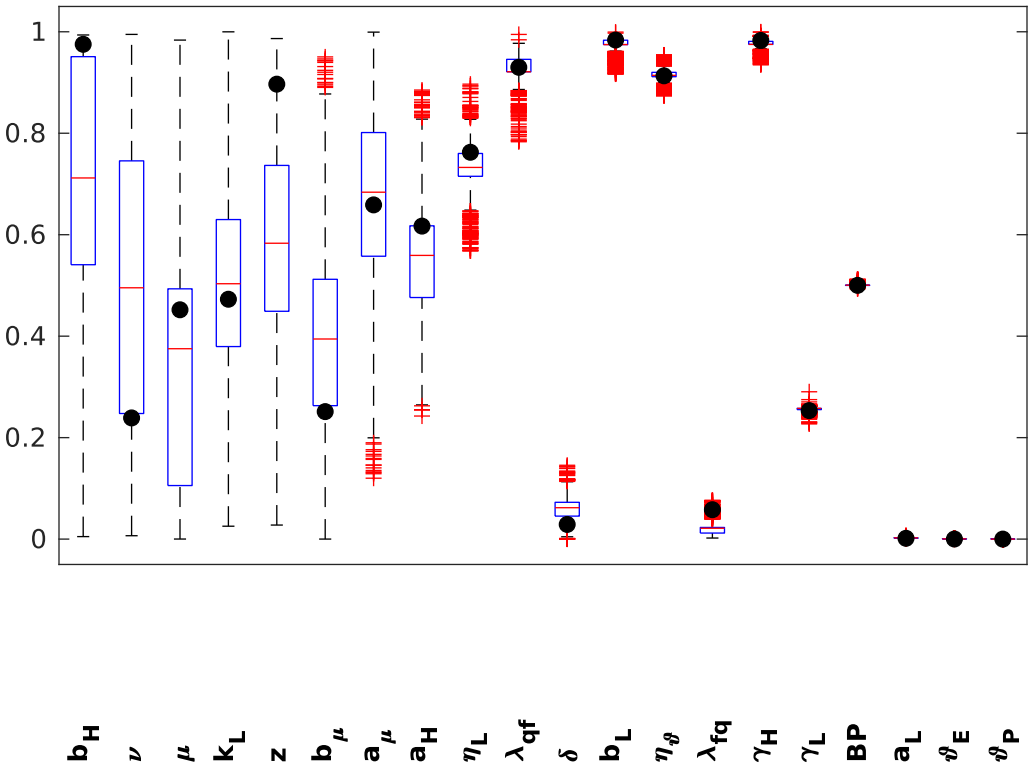
The number of estimations needed to perform the validation was1000.

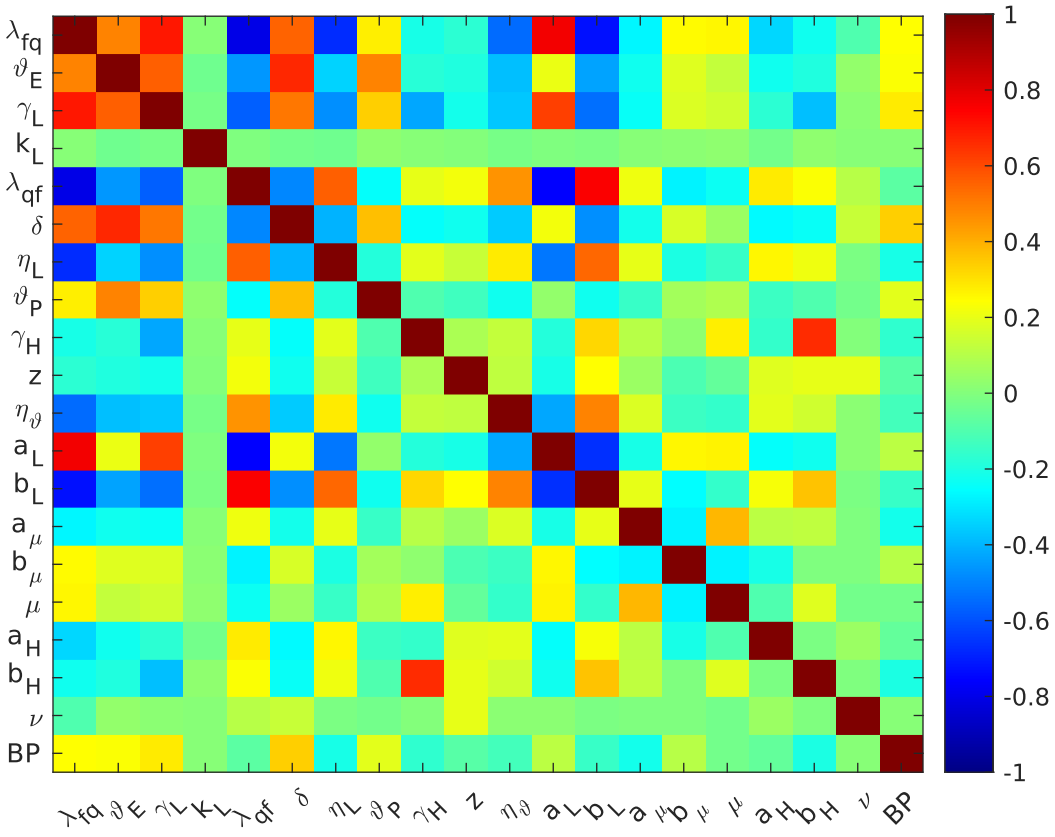
## 19.2. Estimated parameters with their intervals

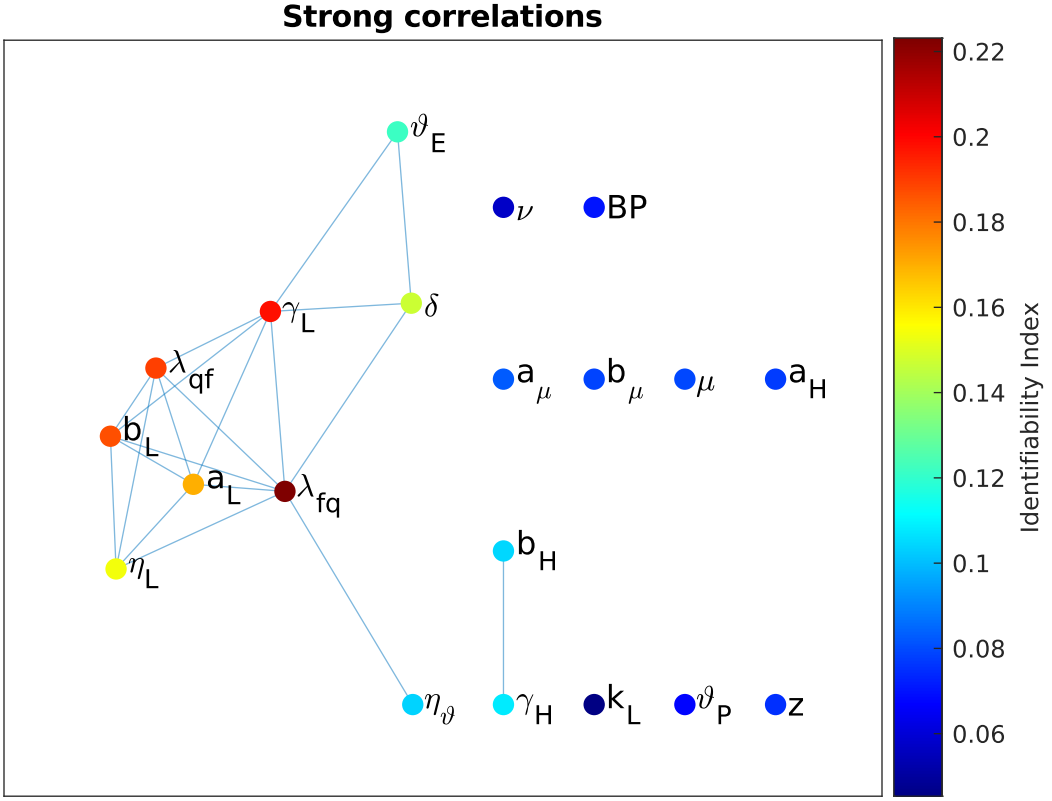
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.0056' | '0.0372' | '0.0214' | '0.0579' | '0.2231' |
| **\vartheta_E** | '0' | '0.0034' | '0.0004' | '0.0002' | '0.1221' |
| **\gamma_L** | '0.2439' | '0.2714' | '0.2577' | '0.2533' | '0.1981' |
| **k_L** | '5.3868' | '5.6736' | '5.5302' | '5.2551' | '0.0453' |
| **\lambda_{qf}** | '0.906' | '0.9362' | '0.9211' | '0.93' | '0.1892' |
| **\delta** | '0.0078' | '0.0108' | '0.0093' | '0.0043' | '0.1469' |
| **\eta_L** | '0.7231' | '0.7421' | '0.7326' | '0.7625' | '0.1542' |
| **\vartheta_P** | '0' | '0.0009' | '0' | '0' | '0.068' |
| **\gamma_H** | '0.95' | '1' | '0.9751' | '0.9829' | '0.1081' |
| **z** | '17.0347' | '17.9559' | '17.4953' | '26.9023' | '0.0758' |
| **\eta_\vartheta** | '0.9069' | '0.9213' | '0.9141' | '0.9132' | '0.1039' |
| **a_L** | '1' | '1.2275' | '1.034' | '1.0222' | '0.1701' |
| **b_L** | '14.4425' | '14.8506' | '14.6465' | '14.772' | '0.1868' |
| **a_\mu** | '10.3415' | '10.7989' | '10.5702' | '10.2228' | '0.0834' |
| **b_\mu** | '6.2972' | '6.7482' | '6.5227' | '4.518' | '0.0788' |
| **\mu** | '0.3583' | '0.3922' | '0.3753' | '0.452' | '0.0795' |
| **a_H** | '8.6614' | '8.9959' | '8.8286' | '9.6371' | '0.0776' |
| **b_H** | '10.6782' | '11.2539' | '10.966' | '14.6543' | '0.1048' |
| **\nu** | '236.5525' | '258.8235' | '247.688' | '119.4221' | '0.0573' |
| **BP** | '451.4716' | '451.5317' | '451.5016' | '451.5005' | '0.0705' |

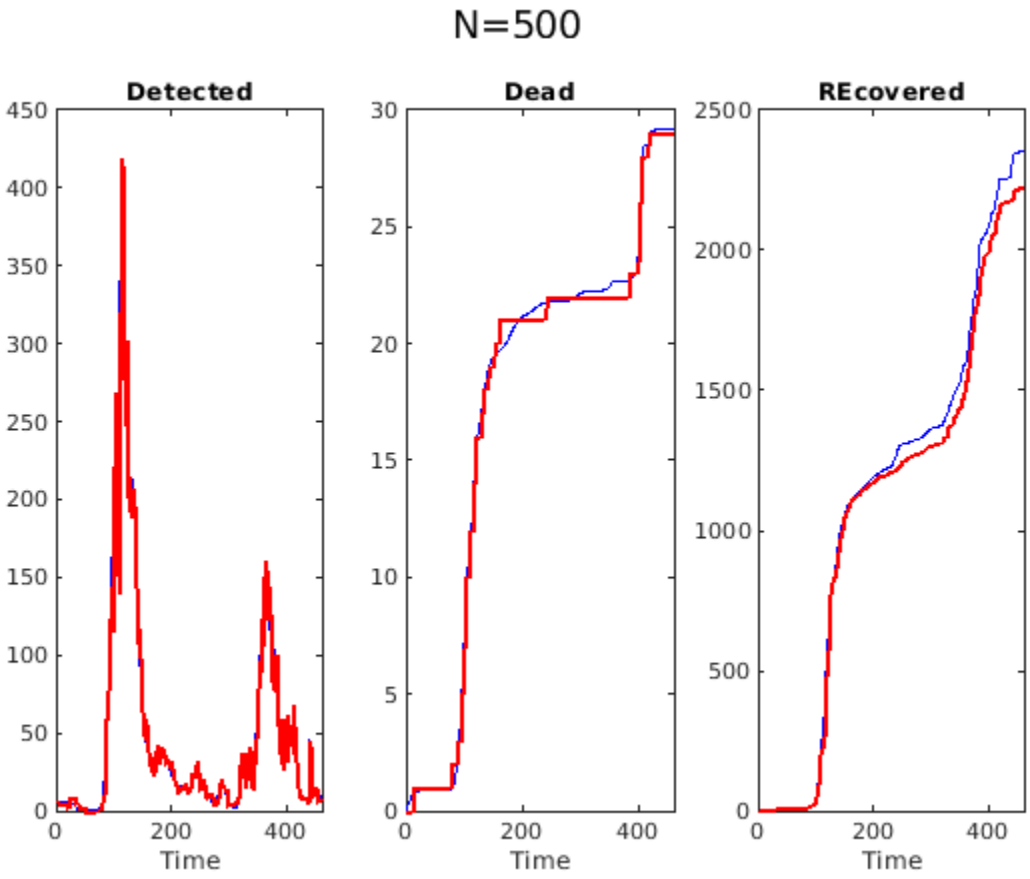
## 19.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$\nu$
BP
$\gamma_L$
$\delta$
$\lambda_{qf}$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_L$
$a_L$
$\lambda_{fq}$
$b_H$
$\eta_L$
$\eta_\vartheta$
$\gamma_H$
$k_L$
$\vartheta_P$
z
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
Identifiability Index

## 19.4. Uncertainty analisys



# Chapter 20. Extension number20

## 20.1. Basic information

The extension to be validated consists of the time series from the data463 to the 483. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

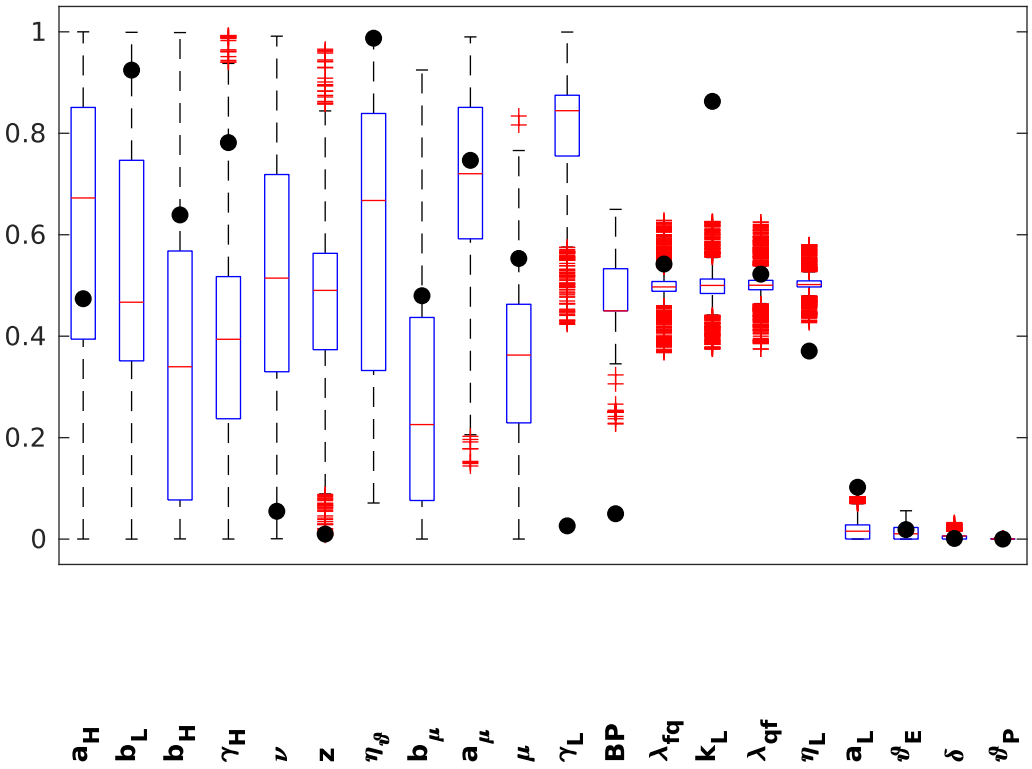
## 20.2. Estimated parameters with their intervals

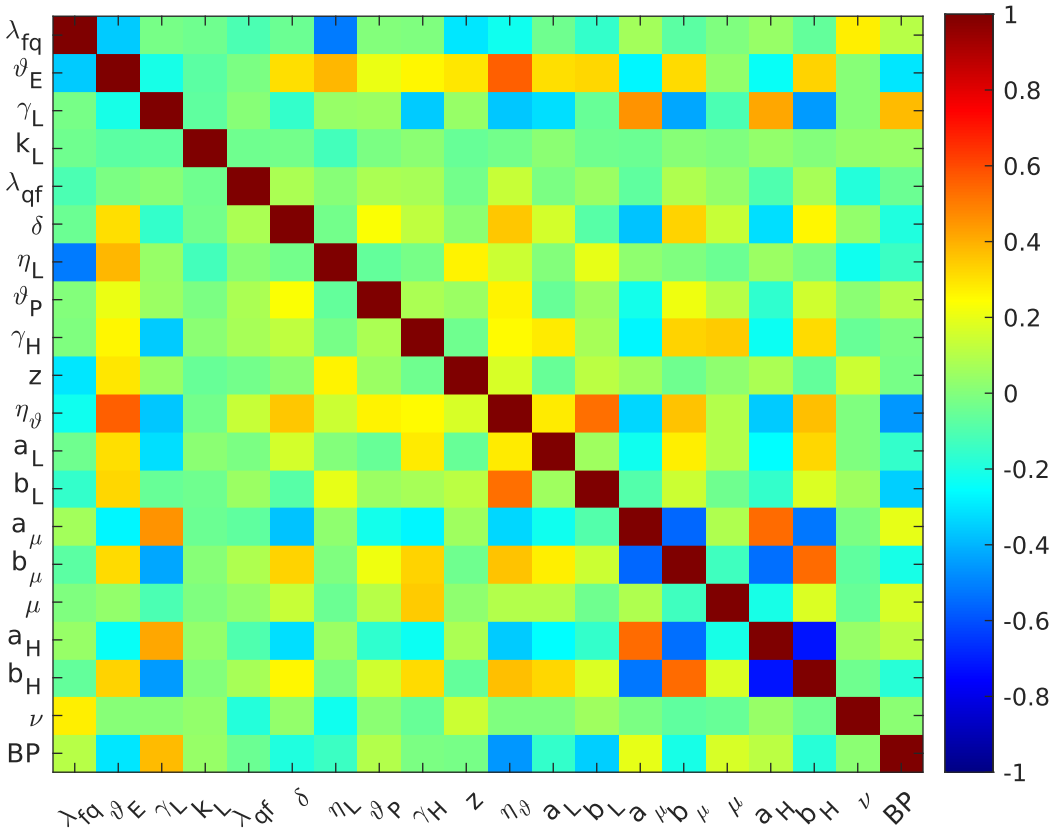
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

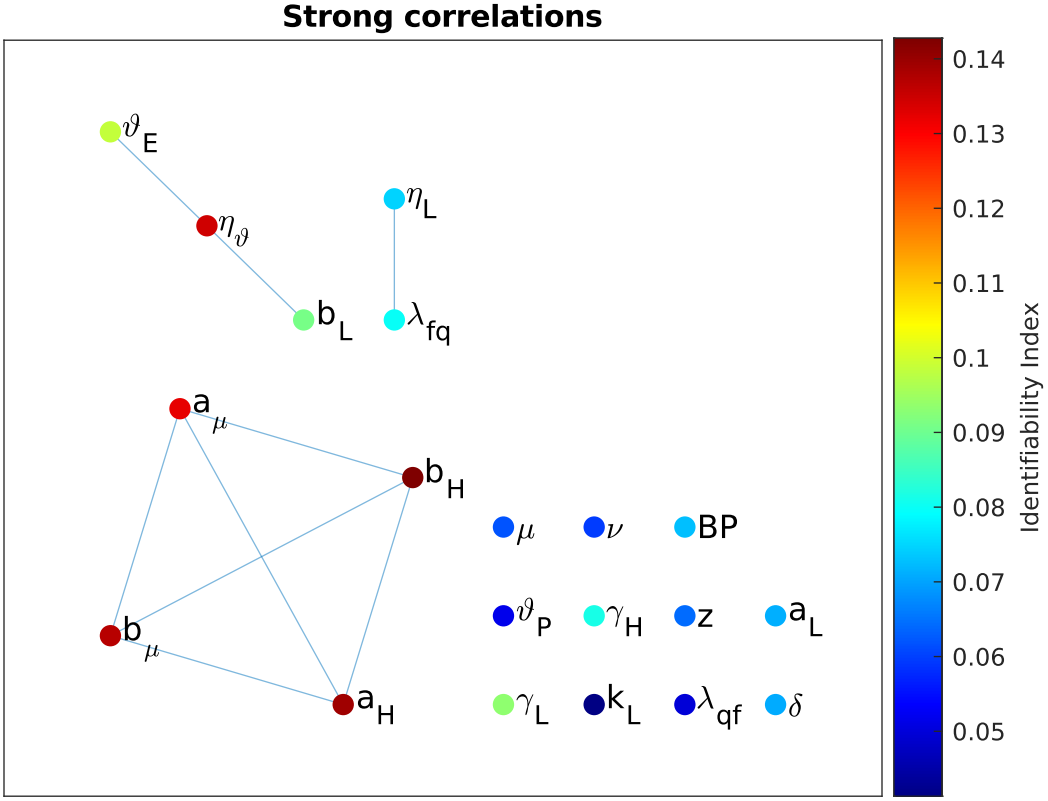
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '1' | '0.4971' | '0.5422' | '0.08' |
| **\vartheta_E** | '0.0111' | '0.0302' | '0.0105' | '0.0187' | '0.0985' |
| **\gamma_L** | '0' | '0.0588' | '0.8445' | '0.0261' | '0.0933' |
| **k_L** | '1' | '10' | '5.5006' | '8.7663' | '0.0413' |
| **\lambda_{qf}** | '0' | '1' | '0.5005' | '0.5223' | '0.05' |
| **\delta** | '0' | '0.0004' | '0.0009' | '0.0002' | '0.0708' |
| **\eta_L** | '0' | '0.8341' | '0.5018' | '0.3707' | '0.0749' |
| **\vartheta_P** | '0' | '0.0002' | '0.0004' | '0.0001' | '0.0517' |
| **\gamma_H** | '0' | '1' | '0.3939' | '0.7816' | '0.0816' |
| **z** | '0' | '0.6735' | '14.7086' | '0.2993' | '0.0643' |
| **\eta_\vartheta** | '0.7738' | '1' | '0.6675' | '0.9874' | '0.1347' |
| **a_L** | '1' | '15' | '1.2183' | '2.4307' | '0.0713' |
| **b_L** | '1' | '15' | '7.5377' | '13.9434' | '0.0912' |
| **a_\mu** | '1' | '15' | '11.0838' | '11.4533' | '0.1321' |
| **b_\mu** | '1' | '15' | '4.1609' | '7.7162' | '0.1371' |
| **\mu** | '0' | '1' | '0.3628' | '0.5532' | '0.062' |
| **a_H** | '1' | '15' | '10.4151' | '7.6341' | '0.1394' |
| **b_H** | '1' | '15' | '5.7564' | '9.947' | '0.1428' |
| **\nu** | '0' | '61.7273' | '257.2451' | '27.4344' | '0.0599' |
| **BP** | '463.12' | '468.706' | '467.5' | '463.5' | '0.0728' |

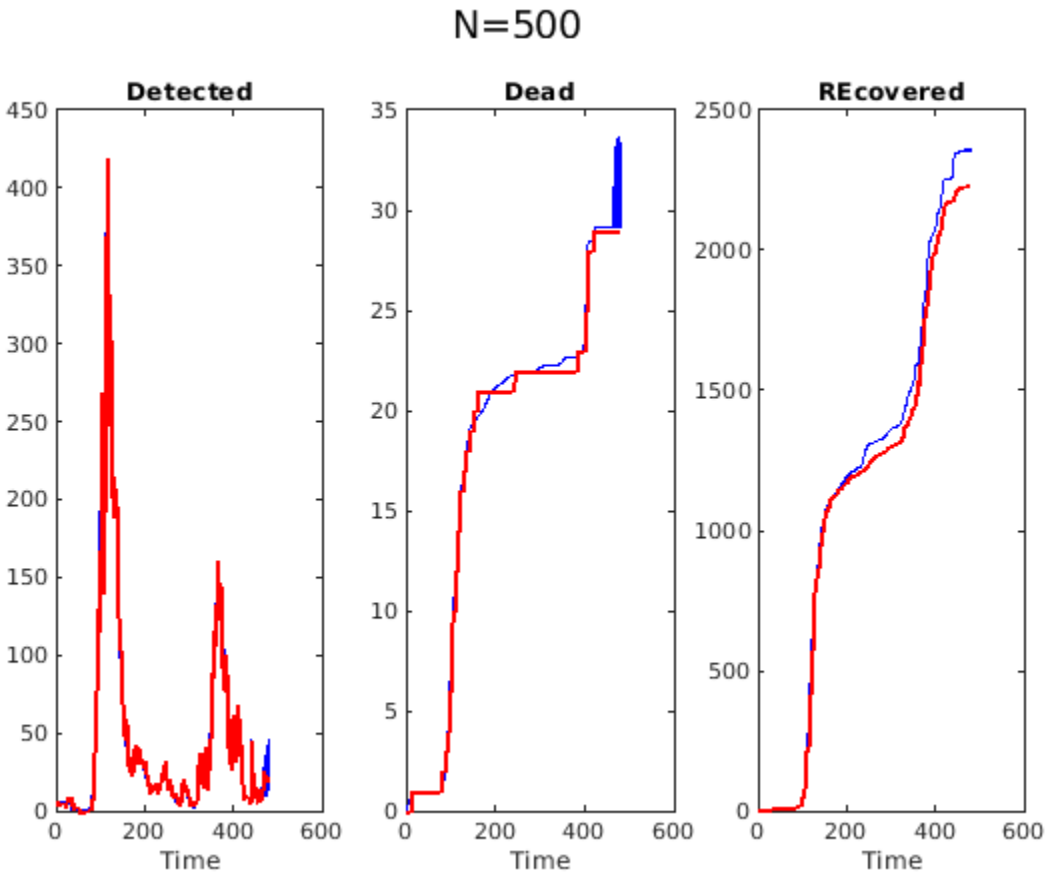
## 20.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$\eta_\vartheta$
$\eta_L$
$b_L$
$\lambda_{fq}$
$a_\mu$
$b_H$
$b_\mu$
$a_H$
$\mu$
$\nu$
BP
$\vartheta_P$
$\gamma_H$
z
$a_L$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 20.4. Uncertainty analisys



# Chapter 21. Extension number21

## 21.1. Basic information

The extension to be validated consists of the time series from the data483 to the 485. The status of the validation is: COMPLETED.

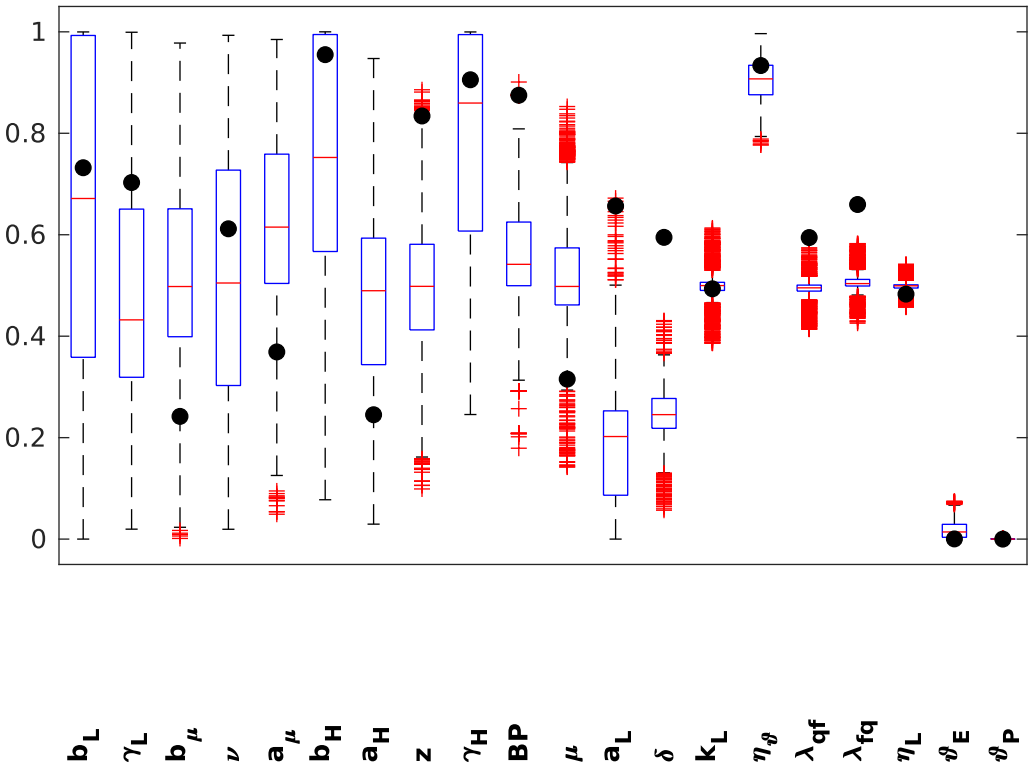
The number of estimations needed to perform the validation was1000.

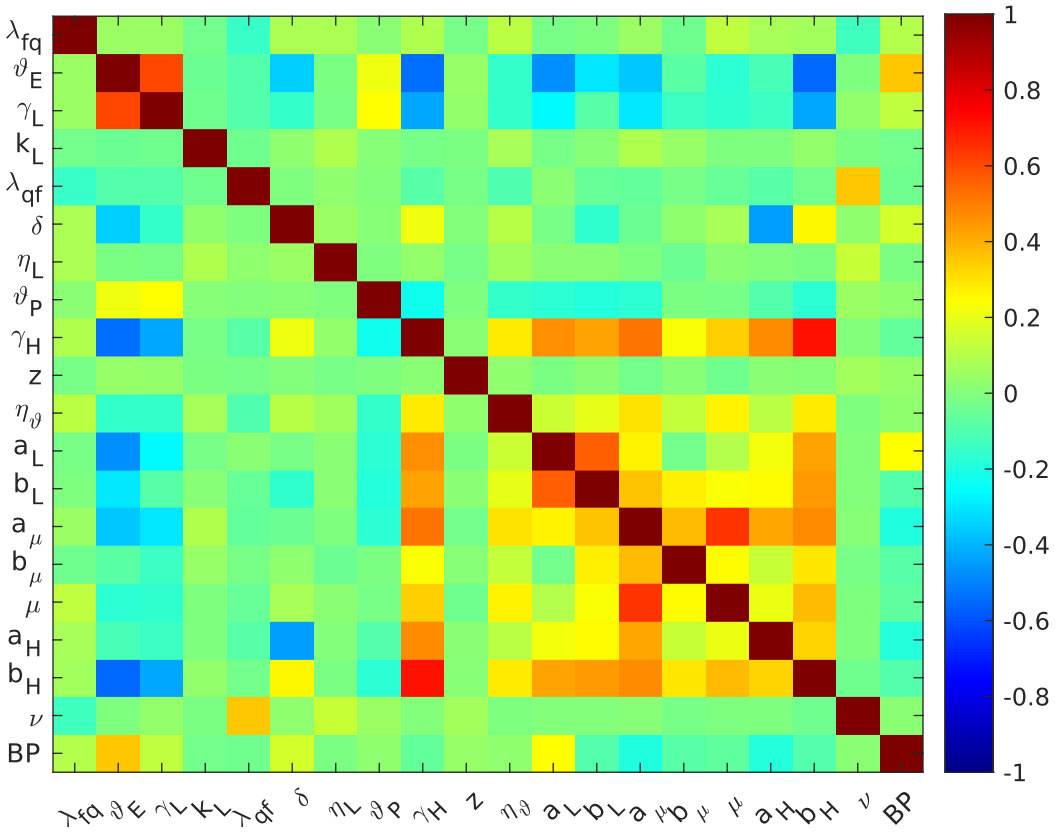
## 21.2. Estimated parameters with their intervals

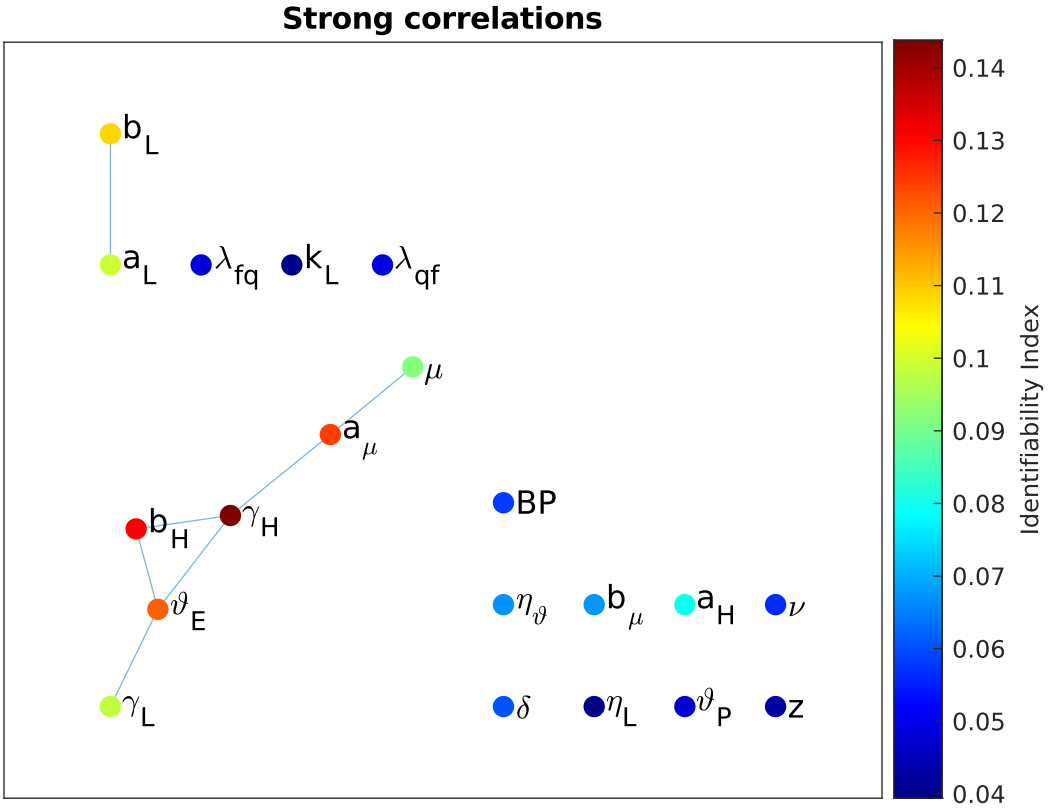
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.4964' | '0.511' | '0.5037' | '0.6596' | '0.0481' |
| **\vartheta_E** | '0.0122' | '0.016' | '0.0141' | '0.0004' | '0.1207' |
| **\gamma_L** | '0.4153' | '0.449' | '0.4322' | '0.7029' | '0.0981' |
| **k_L** | '5.4273' | '5.5691' | '5.4982' | '5.4404' | '0.0406' |
| **\lambda_{qf}** | '0.4873' | '0.5034' | '0.4953' | '0.5945' | '0.0492' |
| **\delta** | '0.0356' | '0.038' | '0.0368' | '0.0892' | '0.0607' |
| **\eta_L** | '0.4932' | '0.5053' | '0.4993' | '0.4829' | '0.0394' |
| **\vartheta_P** | '0' | '0.0005' | '0.0001' | '0' | '0.0474' |
| **\gamma_H** | '0.843' | '0.8762' | '0.8596' | '0.9055' | '0.1438' |
| **z** | '14.5633' | '15.3314' | '14.9473' | '25.0232' | '0.0432' |
| **\eta_\vartheta** | '0.8986' | '0.9159' | '0.9072' | '0.9335' | '0.0674' |
| **a_L** | '3.5807' | '4.0806' | '3.8307' | '10.1937' | '0.099' |
| **b_L** | '10.0496' | '10.751' | '10.4003' | '11.2492' | '0.1085' |
| **a_\mu** | '9.3933' | '9.8277' | '9.6105' | '6.1656' | '0.1239' |
| **b_\mu** | '7.7606' | '8.1807' | '7.9707' | '4.3868' | '0.0679' |
| **\mu** | '0.4829' | '0.5132' | '0.4981' | '0.3154' | '0.0919' |
| **a_H** | '7.6661' | '8.0436' | '7.8549' | '4.432' | '0.0798' |
| **b_H** | '11.2808' | '11.7839' | '11.5323' | '14.3699' | '0.1308' |
| **\nu** | '242.3995' | '262.4511' | '252.4253' | '305.8629' | '0.0566' |
| **BP** | '469.3898' | '469.6102' | '469.5' | '473.5' | '0.0583' |

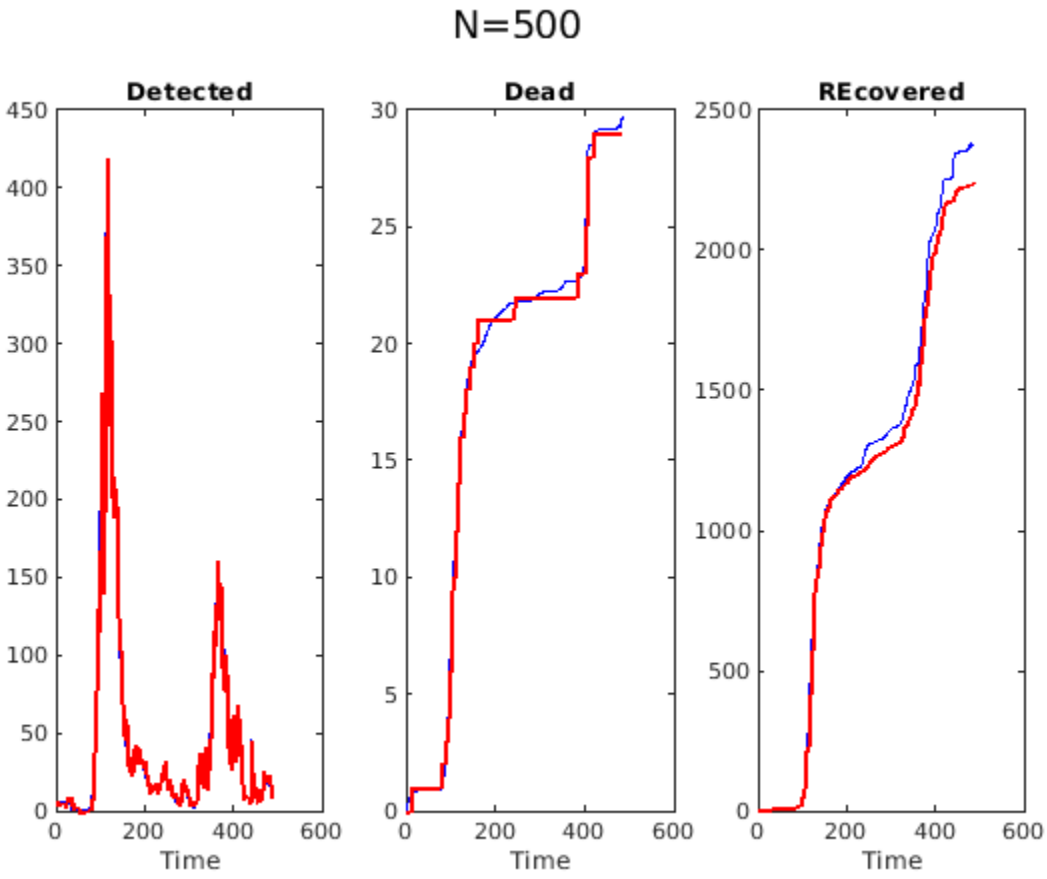
## 21.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
b L
a L
λ fq
k L
λ qf
μ
a μ
b H
γ H
ϑ E
γ L
BP
η ϑ
b μ
a H
ν
δ
η L
ϑ P
z
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
Identifiability Index

## 21.4. Uncertainty analisys



# Chapter 22. Extension number22

## 22.1. Basic information

The extension to be validated consists of the time series from the data485 to the 499. The status of the validation is: COMPLETED.

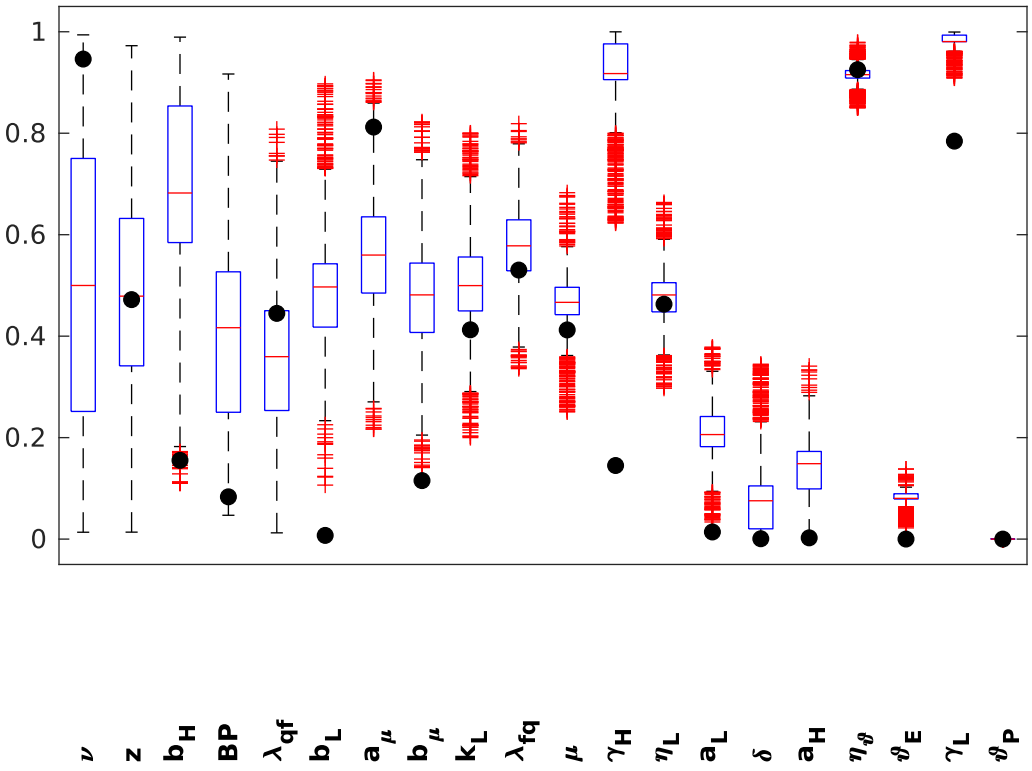
The number of estimations needed to perform the validation was1000.

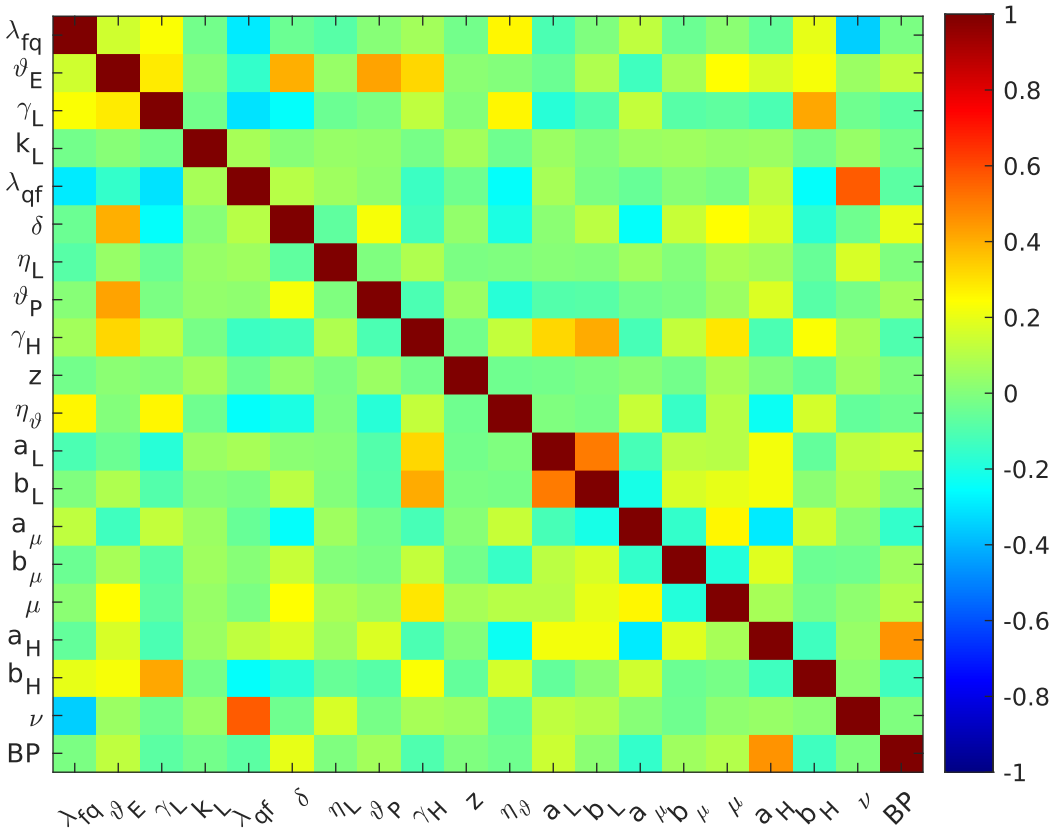
## 22.2. Estimated parameters with their intervals

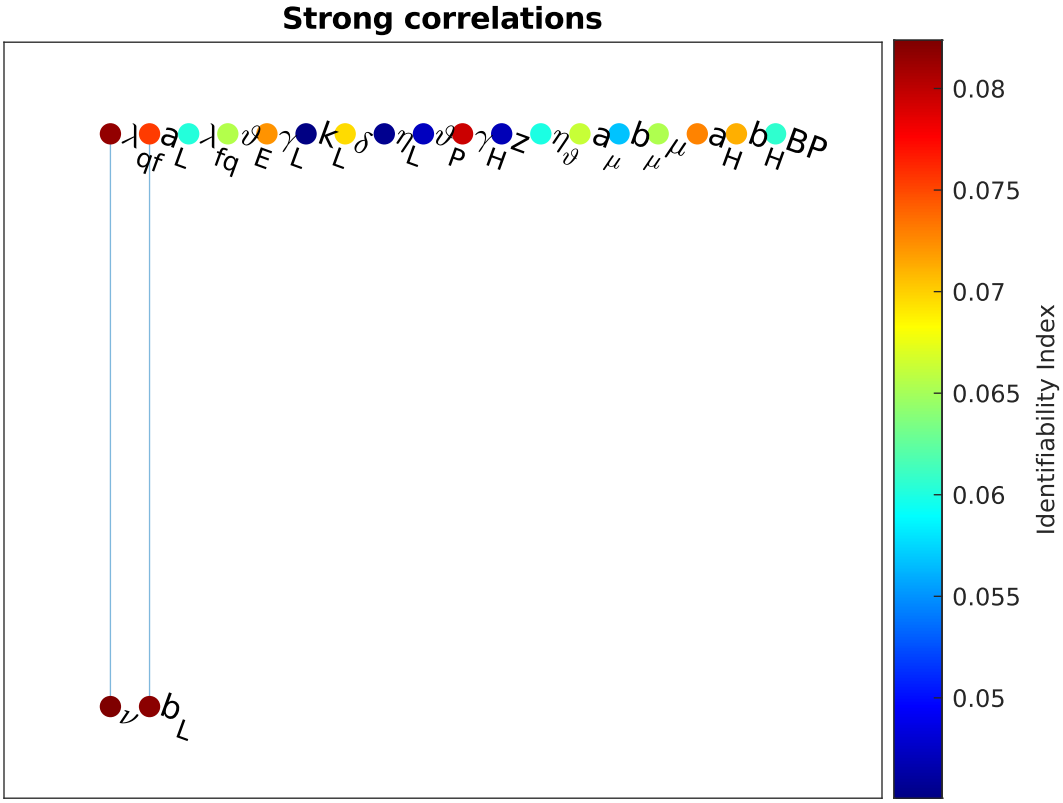
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.5691' | '0.587' | '0.5781' | '0.5303' | '0.0602' |
| **\vartheta_E** | '0.0767' | '0.084' | '0.0803' | '0.0001' | '0.0656' |
| **\gamma_L** | '0.9673' | '0.9938' | '0.9806' | '0.7844' | '0.0723' |
| **k_L** | '5.3945' | '5.5994' | '5.4969' | '4.713' | '0.0451' |
| **\lambda_{qf}** | '0.3481' | '0.3711' | '0.3596' | '0.4449' | '0.0816' |
| **\delta** | '0.0099' | '0.0128' | '0.0113' | '0.0001' | '0.0696' |
| **\eta_L** | '0.4718' | '0.4907' | '0.4812' | '0.4631' | '0.0456' |
| **\vartheta_P** | '0' | '0.0025' | '0' | '0' | '0.0474' |
| **\gamma_H** | '0.8995' | '0.9356' | '0.9176' | '0.145' | '0.0795' |
| **z** | '13.9306' | '14.8016' | '14.3661' | '14.1605' | '0.047' |
| **\eta_\vartheta** | '0.9085' | '0.9224' | '0.9154' | '0.9252' | '0.06' |
| **a_L** | '3.7557' | '4.0134' | '3.8845' | '1.1966' | '0.0754' |
| **b_L** | '7.7352' | '8.1809' | '7.958' | '1.1021' | '0.0819' |
| **a_\mu** | '8.6822' | '8.9939' | '8.838' | '12.3699' | '0.0663' |
| **b_\mu** | '7.5844' | '7.8934' | '7.7389' | '2.614' | '0.0567' |
| **\mu** | '0.4538' | '0.4795' | '0.4666' | '0.4123' | '0.0653' |
| **a_H** | '2.9142' | '3.2482' | '3.0812' | '1.0347' | '0.0728' |
| **b_H** | '10.3306' | '10.7691' | '10.5498' | '3.174' | '0.0712' |
| **\nu** | '238.8826' | '261.0214' | '249.952' | '473.0852' | '0.0824' |
| **BP** | '485.4202' | '485.5798' | '485.5' | '483.5' | '0.0607' |

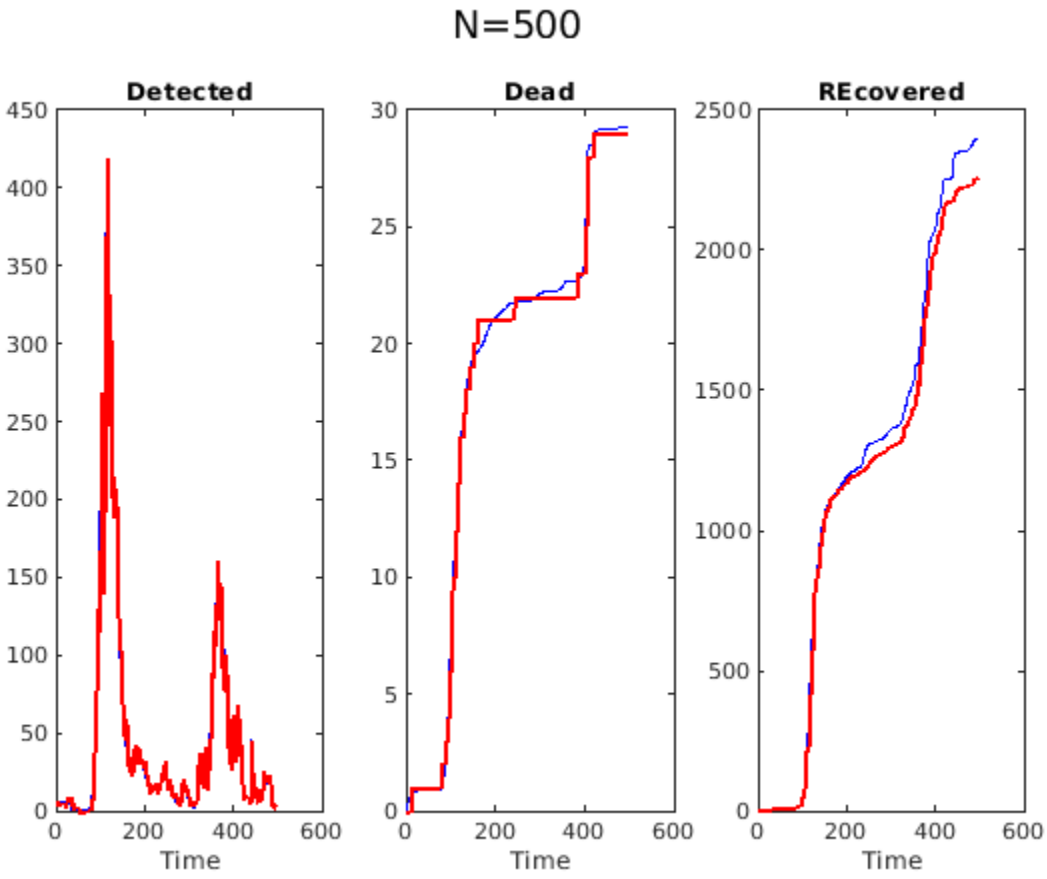
## 22.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\lambda_{qf}$
$a_L$
$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
$z$
$\eta_\vartheta$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$BP$
$\nu$
$b_L$
0.08
0.075
0.07
0.065
0.06
0.055
0.05
Identifiability Index

## 22.4. Uncertainty analisys



# Chapter 23. Extension number23

## 23.1. Basic information

The extension to be validated consists of the time series from the data499 to the 499. The status of the validation is: COMPLETED.

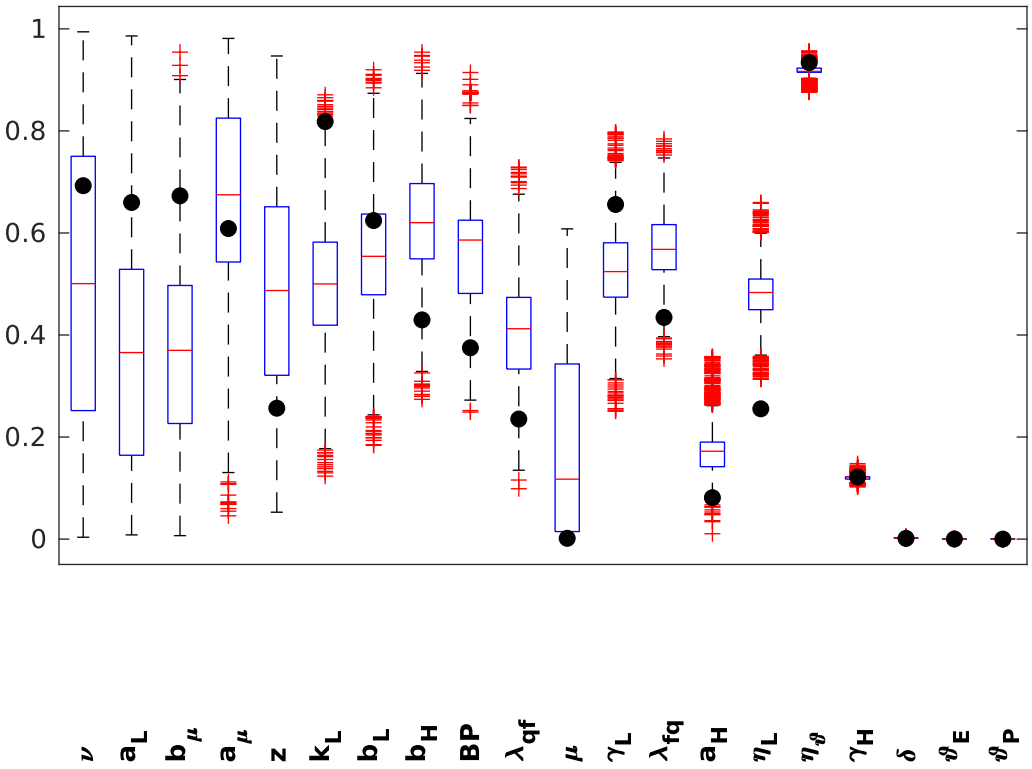
The number of estimations needed to perform the validation was1000.

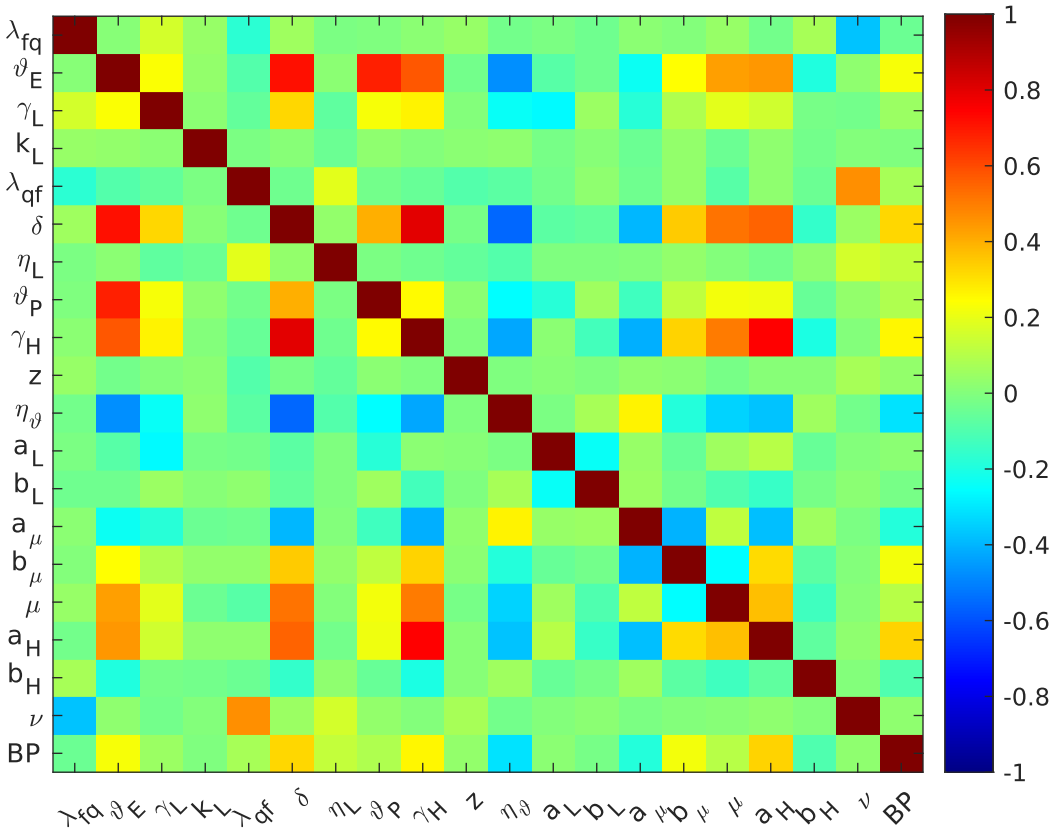
## 23.2. Estimated parameters with their intervals

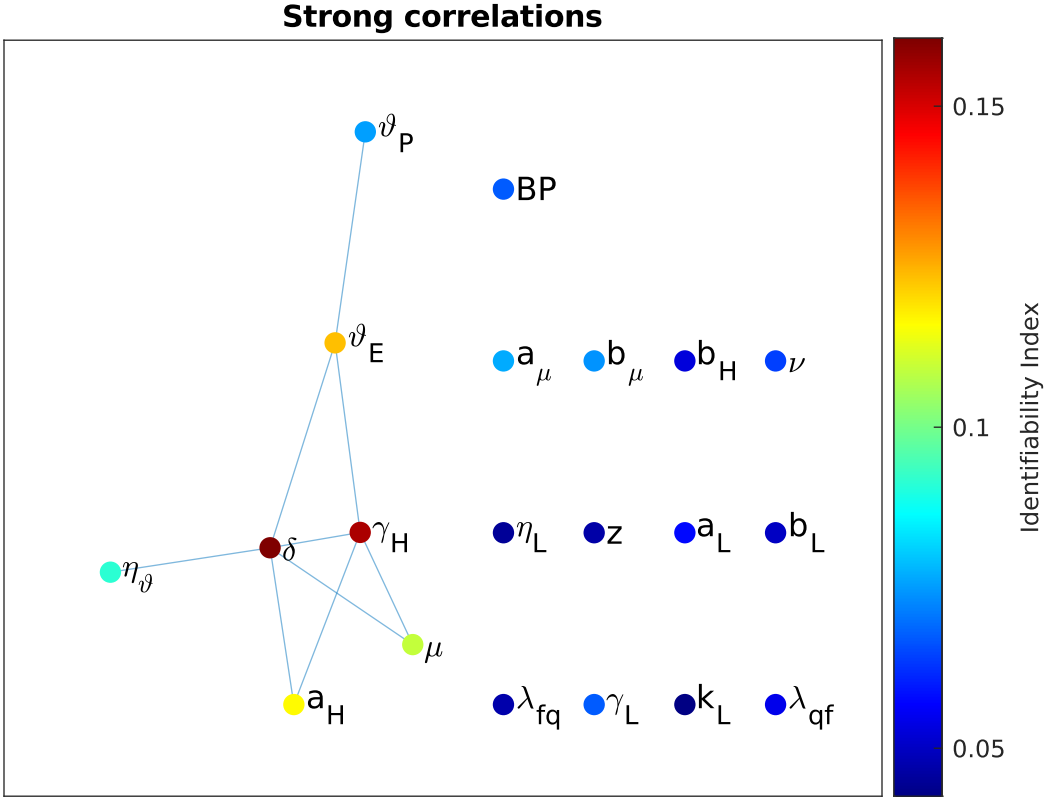
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.5598' | '0.5758' | '0.5678' | '0.4344' | '0.0474' |
| **\vartheta_E** | '0' | '0.0026' | '0.0003' | '0.0002' | '0.1235' |
| **\gamma_L** | '0.5144' | '0.5341' | '0.5243' | '0.6558' | '0.0677' |
| **k_L** | '5.3942' | '5.6075' | '5.5008' | '8.3648' | '0.0425' |
| **\lambda_{qf}** | '0.4028' | '0.4218' | '0.4123' | '0.2353' | '0.0545' |
| **\delta** | '0' | '0.0016' | '0.0003' | '0.0002' | '0.1606' |
| **\eta_L** | '0.4753' | '0.4913' | '0.4833' | '0.2553' | '0.0449' |
| **\vartheta_P** | '0' | '0.0008' | '0' | '0' | '0.0754' |
| **\gamma_H** | '0.1043' | '0.1396' | '0.122' | '0.1217' | '0.1553' |
| **z** | '14.156' | '15.0767' | '14.6163' | '7.6976' | '0.0469' |
| **\eta_\vartheta** | '0.9102' | '0.9233' | '0.9167' | '0.9339' | '0.0916' |
| **a_L** | '5.8764' | '6.3606' | '6.1185' | '10.2371' | '0.0581' |
| **b_L** | '8.5958' | '8.9224' | '8.7591' | '9.7415' | '0.0503' |
| **a_\mu** | '10.2448' | '10.6507' | '10.4478' | '9.5219' | '0.0768' |
| **b_\mu** | '5.9875' | '6.3839' | '6.1857' | '10.419' | '0.0742' |
| **\mu** | '0.103' | '0.1333' | '0.1182' | '0.0015' | '0.1094' |
| **a_H** | '3.2389' | '3.5854' | '3.4122' | '2.1359' | '0.1167' |
| **b_H** | '9.5307' | '9.8344' | '9.6826' | '7.015' | '0.0528' |
| **\nu** | '239.1957' | '261.4787' | '250.3372' | '346.3279' | '0.0642' |
| **BP** | '487.3015' | '487.3876' | '487.3445' | '486.4999' | '0.0678' |

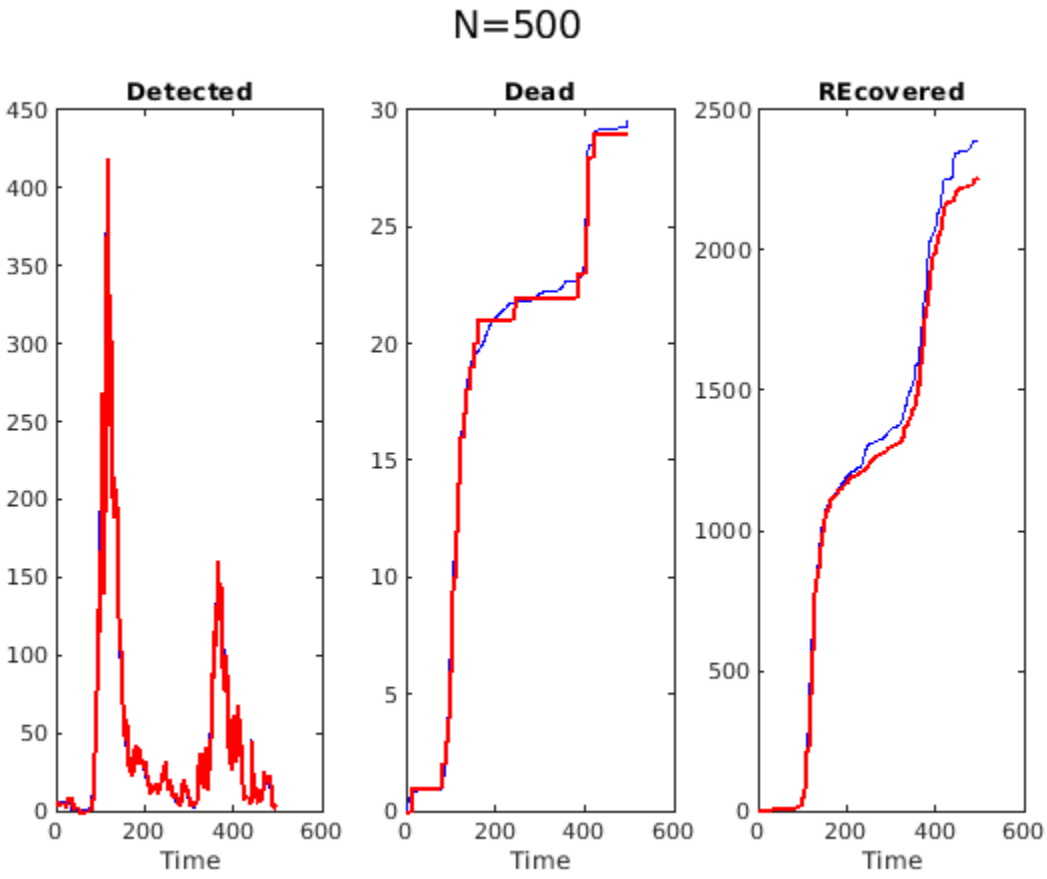
## 23.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_P$
BP
$\vartheta_E$
$a_\mu$
$b_\mu$
$b_H$
$\nu$
$\gamma_H$
$\eta_L$
z
$a_L$
$b_L$
$\delta$
$\eta_\vartheta$
$\mu$
$a_H$
$\lambda_{fq}$
$\gamma_L$
$k_L$
$\lambda_{qf}$
0.15
0.1
0.05
Identifiability Index

## 23.4. Uncertainty analisys



# Chapter 24. Extension number24

## 24.1. Basic information

The extension to be validated consists of the time series from the data499 to the 524. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

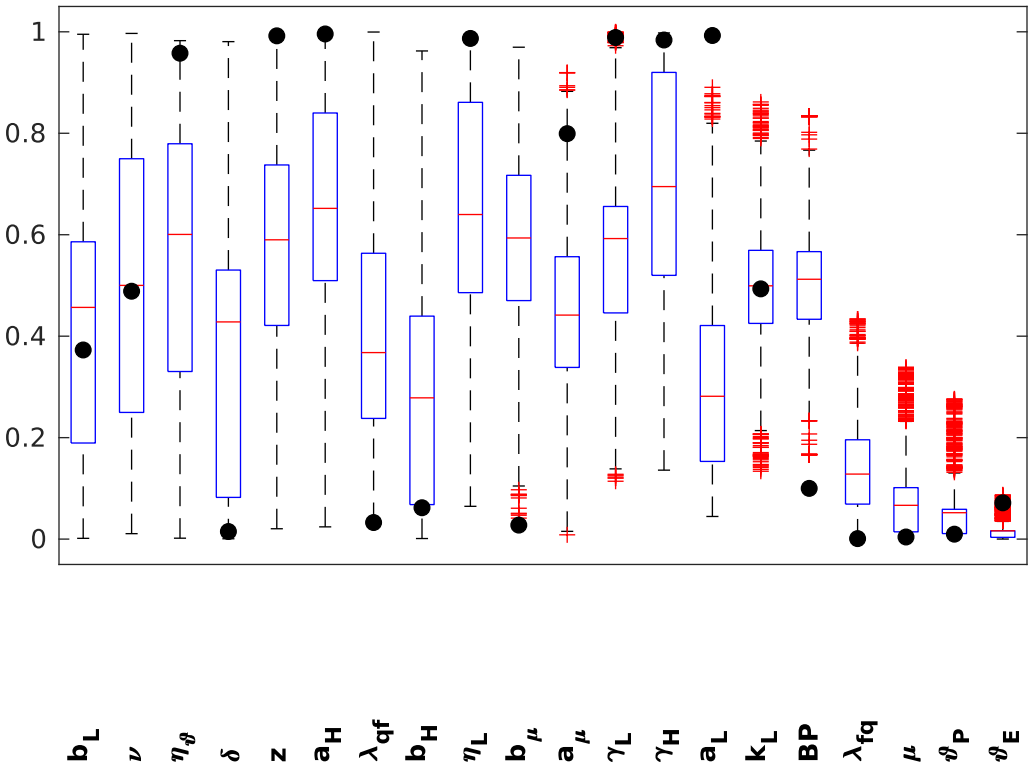
## 24.2. Estimated parameters with their intervals

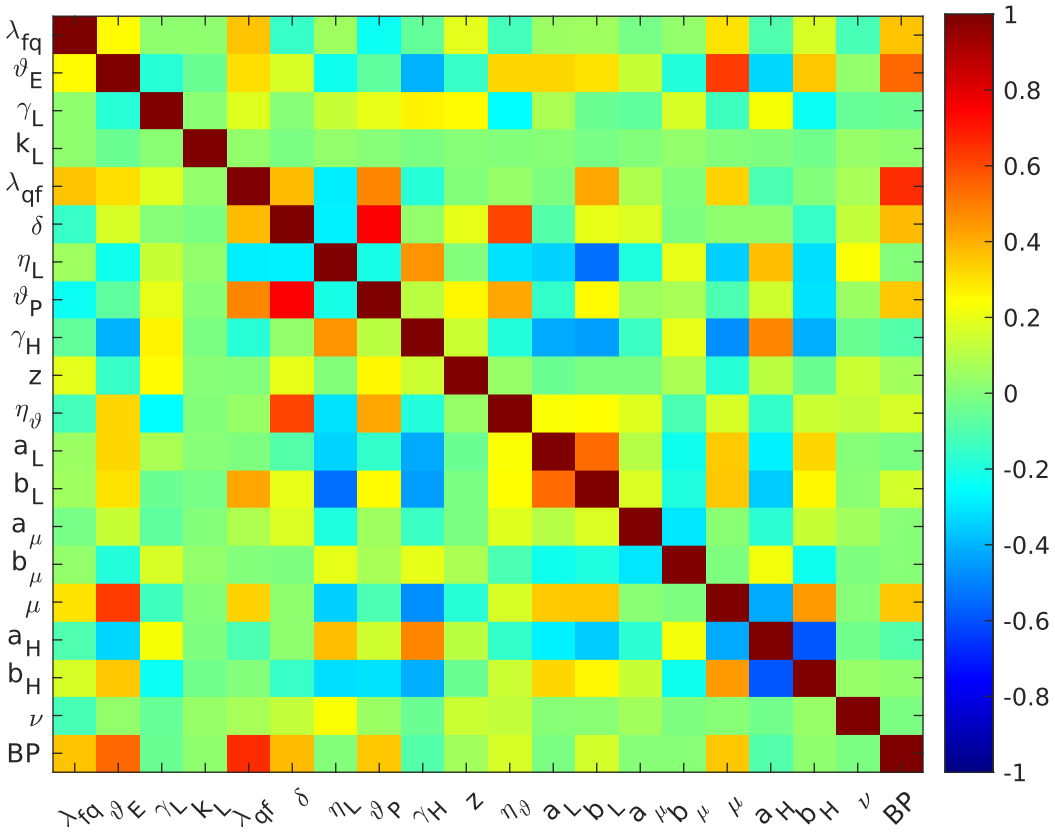
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

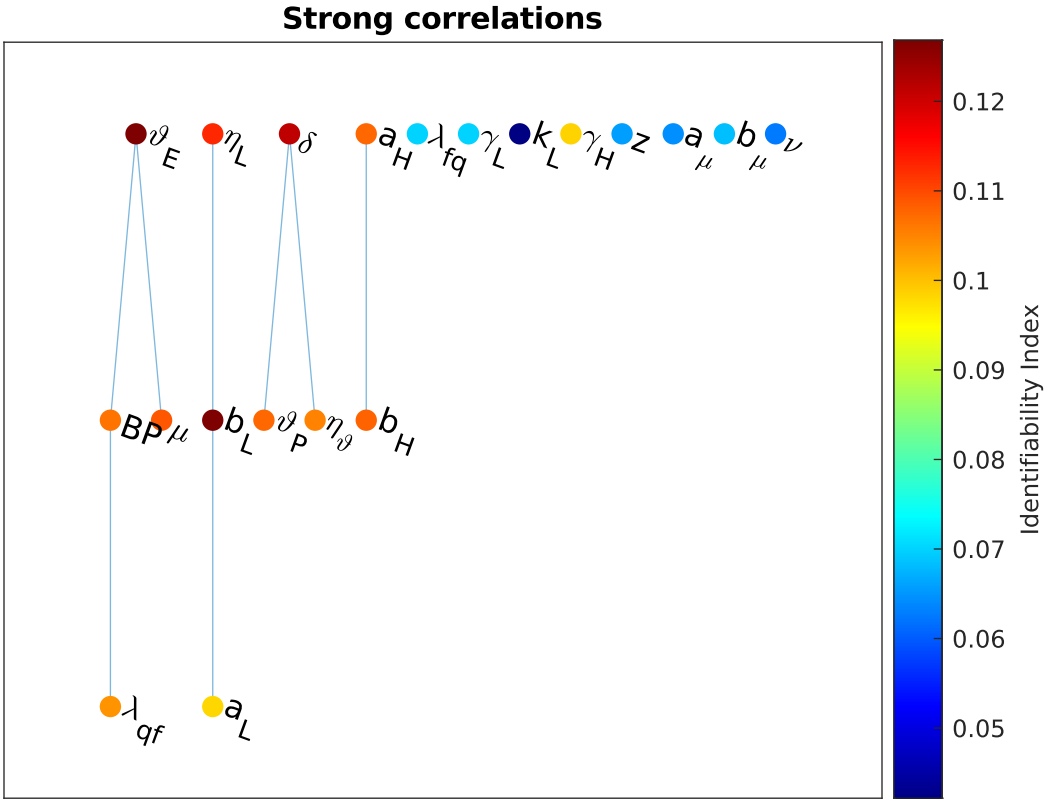
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0.002' | '0.1282' | '0.001' | '0.0701' |
| **\vartheta_E** | '0.0607' | '0.1264' | '0.0164' | '0.0715' | '0.1267' |
| **\gamma_L** | '0.4199' | '1' | '0.5924' | '0.9888' | '0.0702' |
| **k_L** | '1' | '8.695' | '5.4934' | '5.4396' | '0.0422' |
| **\lambda_{qf}** | '0.0278' | '0.0367' | '0.3677' | '0.0327' | '0.104' |
| **\delta** | '0' | '0.0048' | '0.0642' | '0.0022' | '0.1213' |
| **\eta_L** | '0.6878' | '1' | '0.6398' | '0.9869' | '0.1129' |
| **\vartheta_P** | '0.0093' | '0.0167' | '0.052' | '0.0097' | '0.1075' |
| **\gamma_H** | '0.271' | '1' | '0.6949' | '0.9838' | '0.0987' |
| **z** | '18.6086' | '30' | '17.6995' | '29.7623' | '0.0659' |
| **\eta_\vartheta** | '0.8466' | '0.9939' | '0.6006' | '0.9578' | '0.1051' |
| **a_L** | '10.9057' | '15' | '4.9425' | '14.8982' | '0.0981' |
| **b_L** | '5.8188' | '10.416' | '7.3943' | '6.2191' | '0.1268' |
| **a_\mu** | '2.3613' | '13.3269' | '7.182' | '12.1893' | '0.0646' |
| **b_\mu** | '1' | '13.096' | '9.31' | '1.3865' | '0.0686' |
| **\mu** | '0.0009' | '0.0093' | '0.0667' | '0.0041' | '0.1087' |
| **a_H** | '3.66' | '15' | '10.1271' | '14.9405' | '0.1075' |
| **b_H** | '1.28' | '15' | '4.8983' | '1.8654' | '0.1079' |
| **\nu** | '228.1221' | '295.7257' | '250.0568' | '244.3066' | '0.0628' |
| **BP** | '499.0467' | '501.3328' | '506.6833' | '500.4998' | '0.1064' |

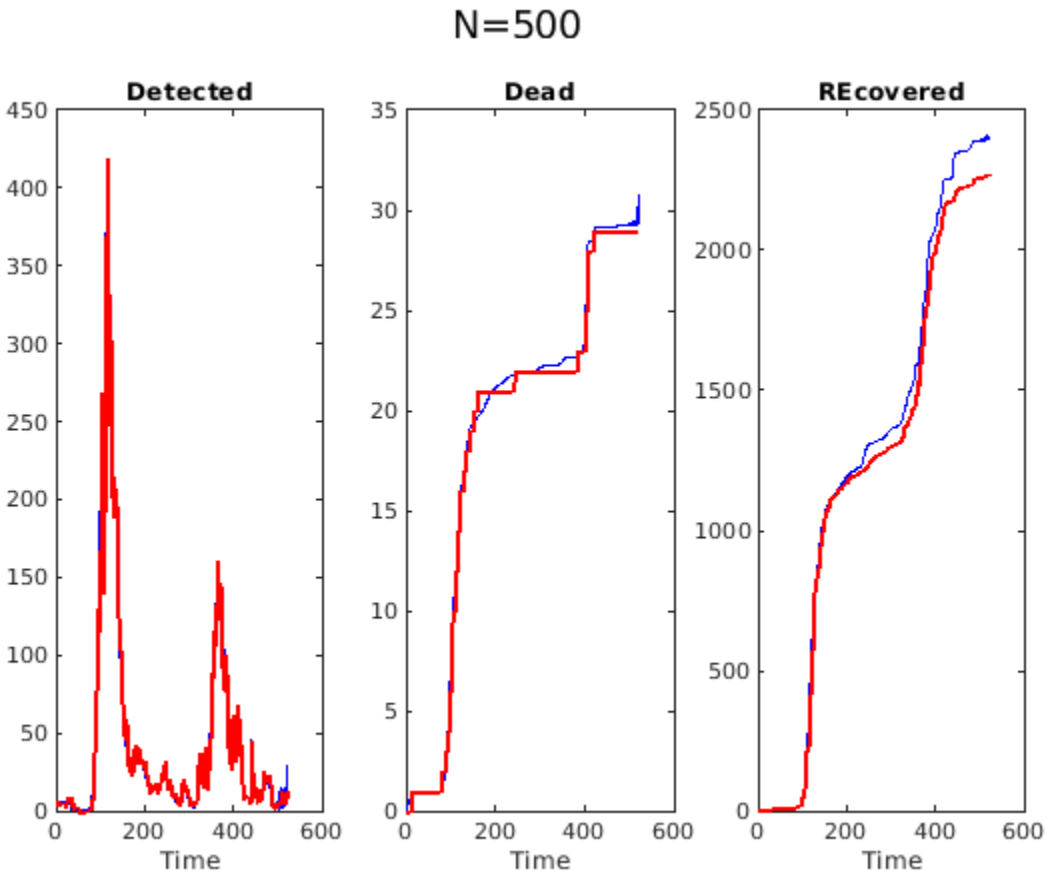
## 24.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$
$\eta_L$
$\delta$
$a_H$
$\lambda_{fq}$
$\gamma_L$
$k_L$
$\gamma_H$
$z$
$a_\mu$
$b_\mu$
$\nu$
$BP$
$\mu$
$b_L$
$\vartheta_P$
$\eta_\vartheta$
$b_H$
$\lambda_{qf}$
$a_L$
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
Identifiability Index

## 24.4. Uncertainty analisys



# Chapter 25. Extension number25

## 25.1. Basic information

The extension to be validated consists of the time series from the data524 to the 531. The status of the validation is: COMPLETED.

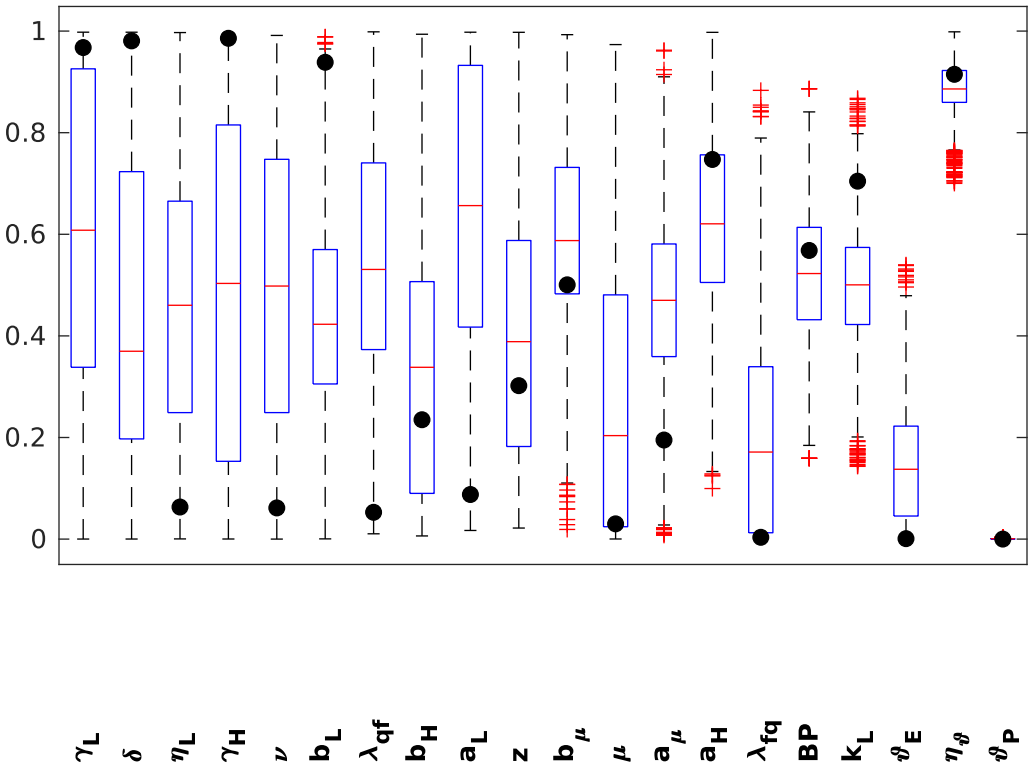
The number of estimations needed to perform the validation was1000.

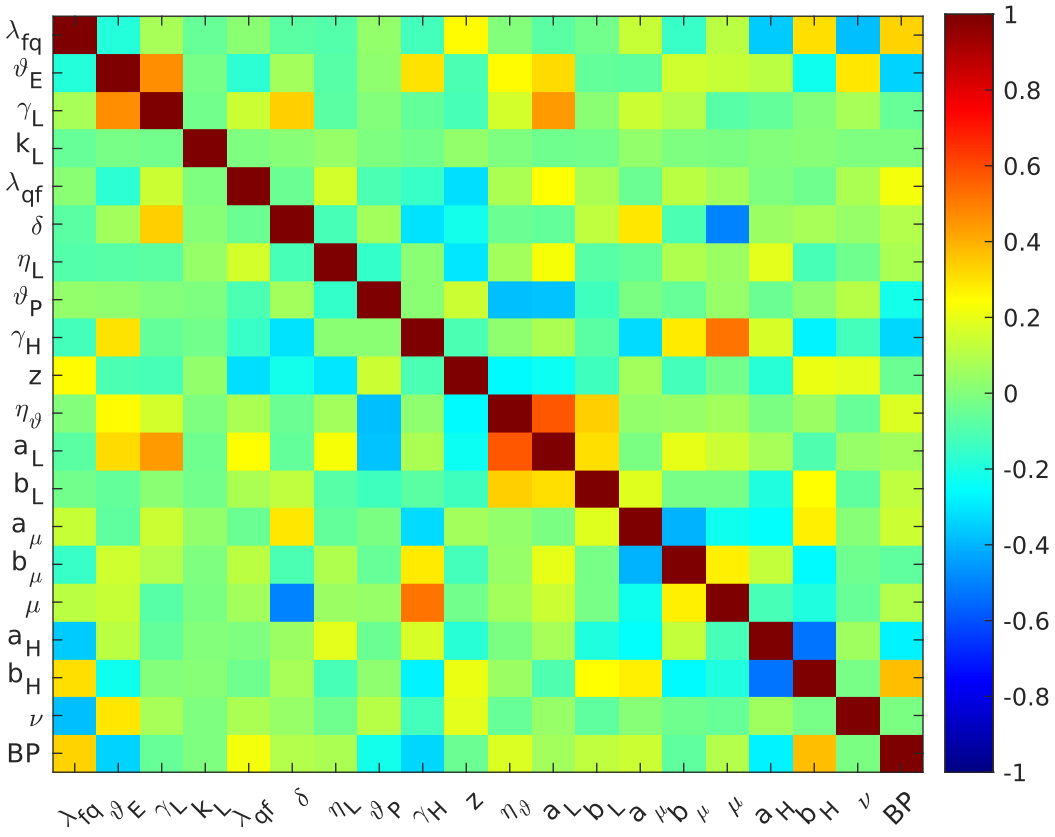
## 25.2. Estimated parameters with their intervals

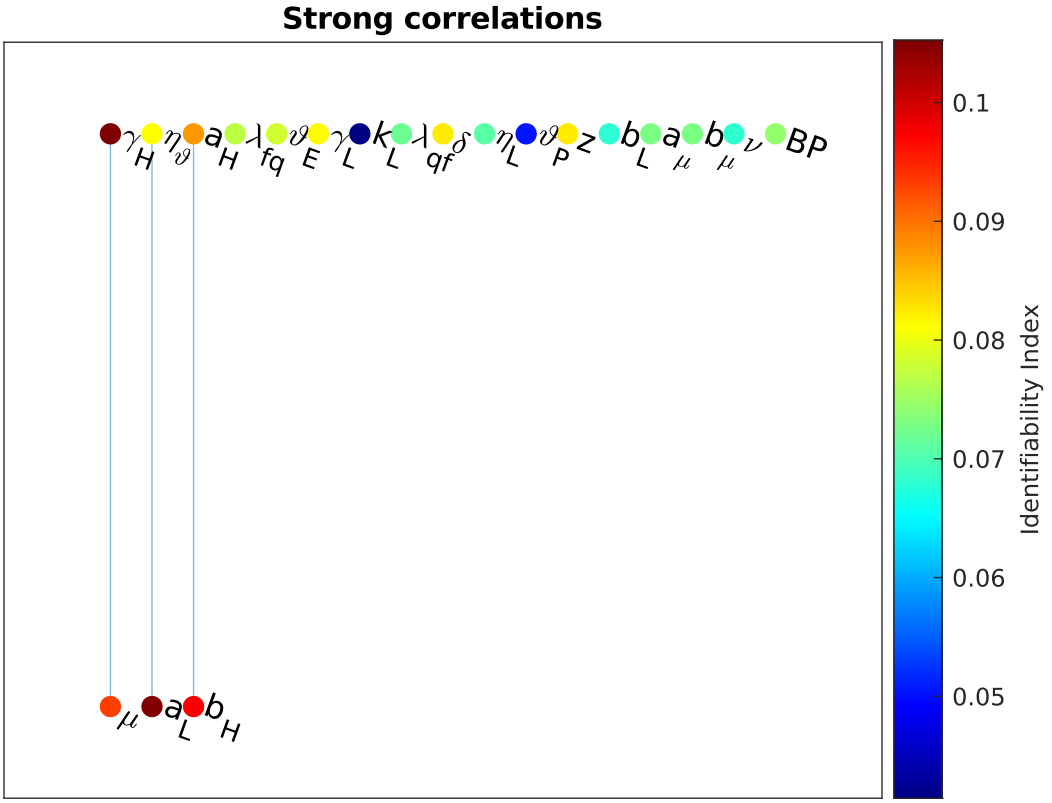
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.1542' | '0.189' | '0.1716' | '0.0035' | '0.0768' |
| **\vartheta_E** | '0.1262' | '0.1488' | '0.1375' | '0.0009' | '0.0783' |
| **\gamma_L** | '0.5817' | '0.6343' | '0.608' | '0.9676' | '0.0815' |
| **k_L** | '5.3976' | '5.6107' | '5.5042' | '7.341' | '0.0414' |
| **\lambda_{qf}** | '0.5099' | '0.5517' | '0.5308' | '0.0528' | '0.0719' |
| **\delta** | '0.0517' | '0.0592' | '0.0555' | '0.1471' | '0.0825' |
| **\eta_L** | '0.4402' | '0.4803' | '0.4603' | '0.0631' | '0.0707' |
| **\vartheta_P** | '0' | '0.0031' | '0.0007' | '0' | '0.0506' |
| **\gamma_H** | '0.477' | '0.5295' | '0.5033' | '0.9858' | '0.1052' |
| **z** | '11.0706' | '12.2476' | '11.6591' | '9.0612' | '0.0825' |
| **\eta_\vartheta** | '0.8753' | '0.8968' | '0.886' | '0.9149' | '0.0813' |
| **a_L** | '9.8792' | '10.502' | '10.1906' | '2.229' | '0.1048' |
| **b_L** | '6.7113' | '7.1295' | '6.9204' | '14.14' | '0.0681' |
| **a_\mu** | '7.3856' | '7.7778' | '7.5817' | '3.7304' | '0.073' |
| **b_\mu** | '9.0084' | '9.4405' | '9.2244' | '8.0074' | '0.0729' |
| **\mu** | '0.1823' | '0.2251' | '0.2037' | '0.03' | '0.093' |
| **a_H** | '9.4754' | '9.9015' | '9.6885' | '11.4621' | '0.0877' |
| **b_H** | '5.4733' | '5.9961' | '5.7347' | '4.2895' | '0.0975' |
| **\nu** | '237.9215' | '260.2081' | '249.0648' | '30.6862' | '0.0683' |
| **BP** | '510.2548' | '510.7452' | '510.5' | '511.5' | '0.0744' |

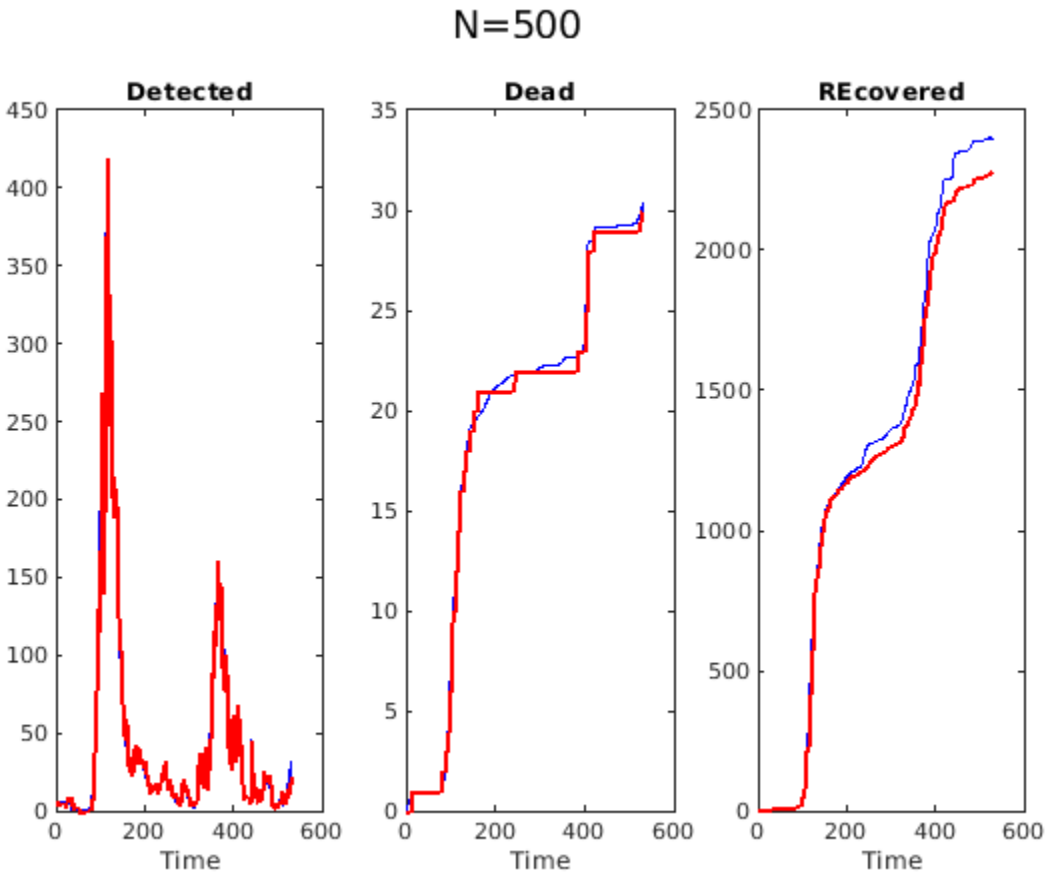
## 25.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.1
0.09
0.08
0.07
0.06
0.05

## 25.4. Uncertainty analisys



# Chapter 26. Extension number26

## 26.1. Basic information

The extension to be validated consists of the time series from the data531 to the 549. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

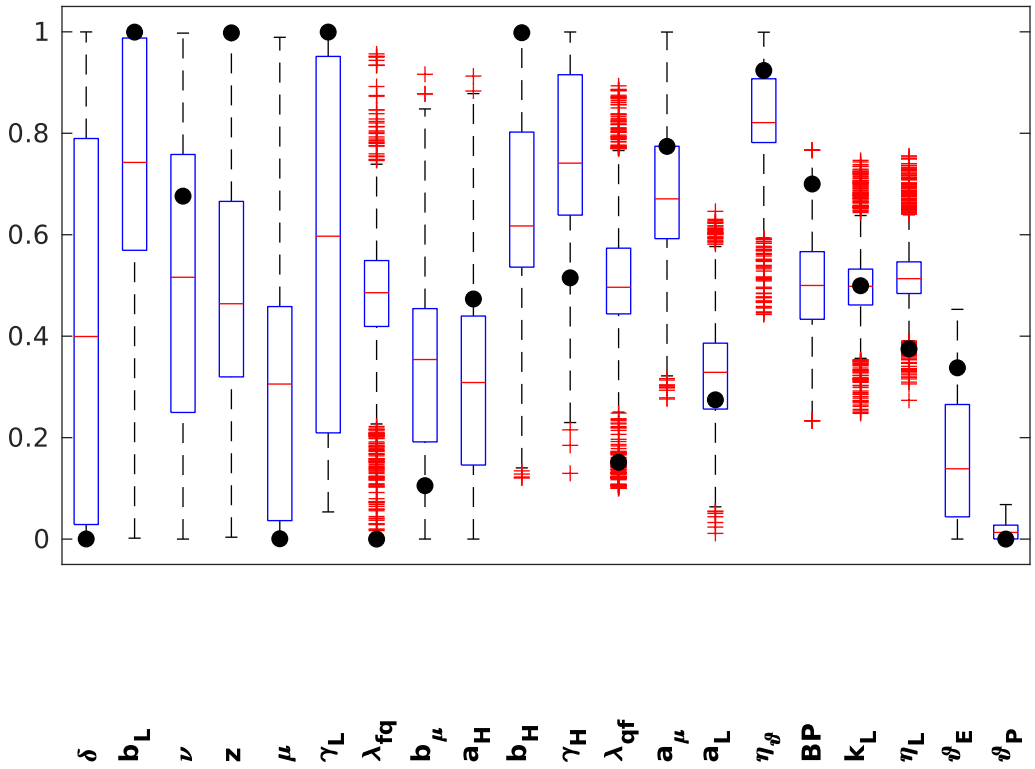
## 26.2. Estimated parameters with their intervals

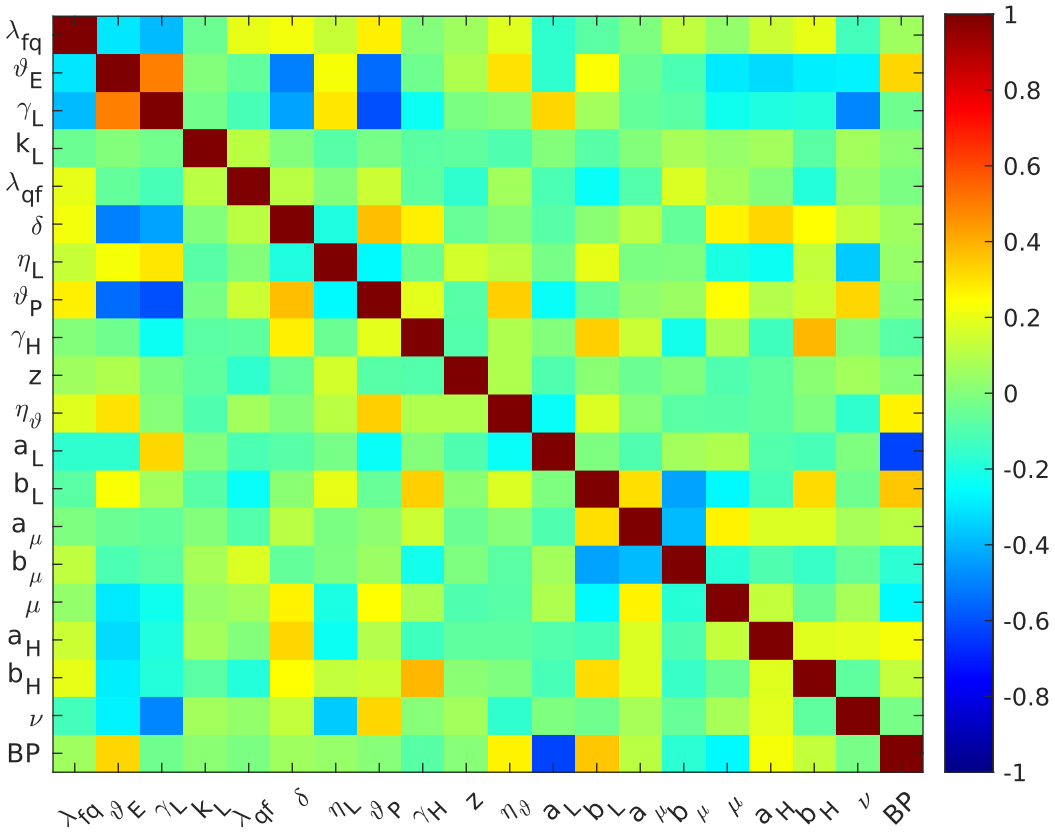
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

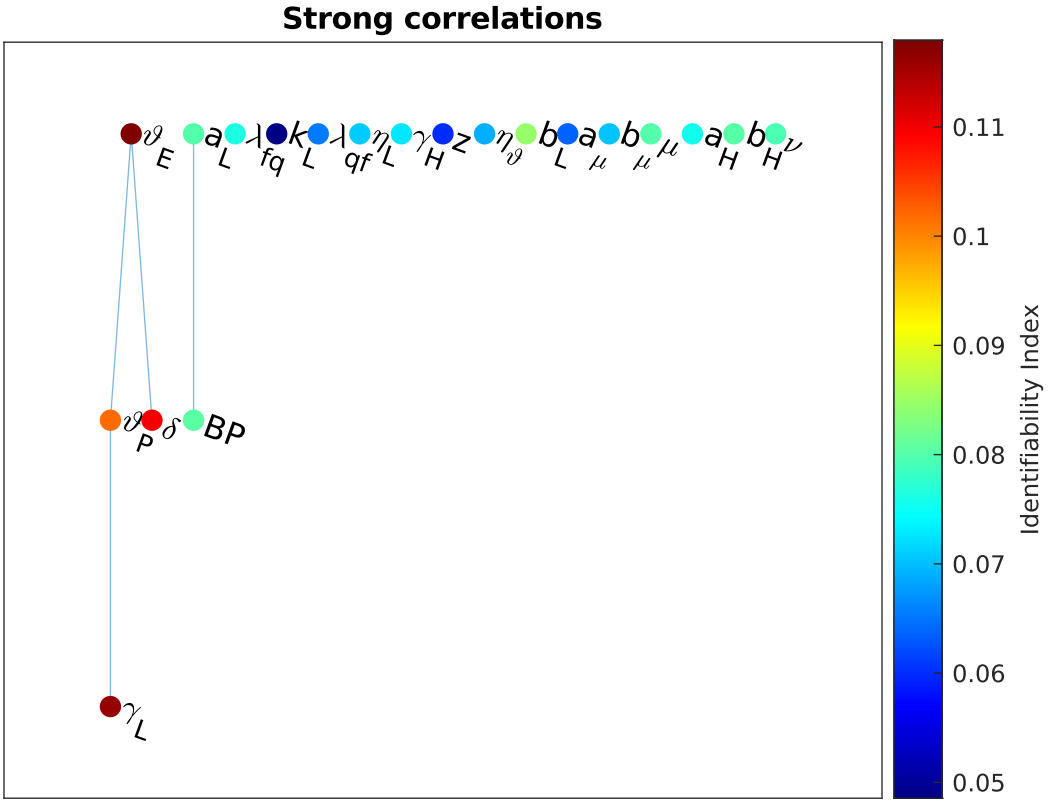
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0' | '0.4857' | '0' | '0.0762' |
| **\vartheta_E** | '0.2338' | '0.3397' | '0.1386' | '0.3377' | '0.1179' |
| **\gamma_L** | '0.0574' | '1' | '0.5971' | '0.9995' | '0.1162' |
| **k_L** | '1' | '10' | '5.4851' | '5.4954' | '0.0485' |
| **\lambda_{qf}** | '0' | '0.3237' | '0.4964' | '0.1514' | '0.0654' |
| **\delta** | '0' | '0.0001' | '0.0599' | '0' | '0.11' |
| **\eta_L** | '0' | '0.8014' | '0.5134' | '0.3749' | '0.071' |
| **\vartheta_P** | '0' | '0' | '0.0132' | '0' | '0.1017' |
| **\gamma_H** | '0.0629' | '0.92' | '0.7411' | '0.515' | '0.0729' |
| **z** | '4.8465' | '30' | '13.9191' | '29.9393' | '0.0599' |
| **\eta_\vartheta** | '0.4363' | '1' | '0.8208' | '0.9238' | '0.0689' |
| **a_L** | '3.6836' | '11.936' | '5.6024' | '4.8437' | '0.0802' |
| **b_L** | '4.2488' | '15' | '11.3956' | '14.9921' | '0.0848' |
| **a_\mu** | '1.35' | '15' | '10.3887' | '11.8381' | '0.0638' |
| **b_\mu** | '1.35' | '15' | '5.9562' | '2.4746' | '0.0704' |
| **\mu** | '0' | '0.0015' | '0.3057' | '0.0007' | '0.08' |
| **a_H** | '1.28' | '14.4512' | '5.3248' | '7.6264' | '0.0755' |
| **b_H** | '1.6913' | '15' | '9.6411' | '14.9752' | '0.0805' |
| **\nu** | '313.5699' | '500' | '258.0672' | '338.043' | '0.0796' |
| **BP** | '531.3807' | '534.5661' | '531.5' | '534.5' | '0.0808' |

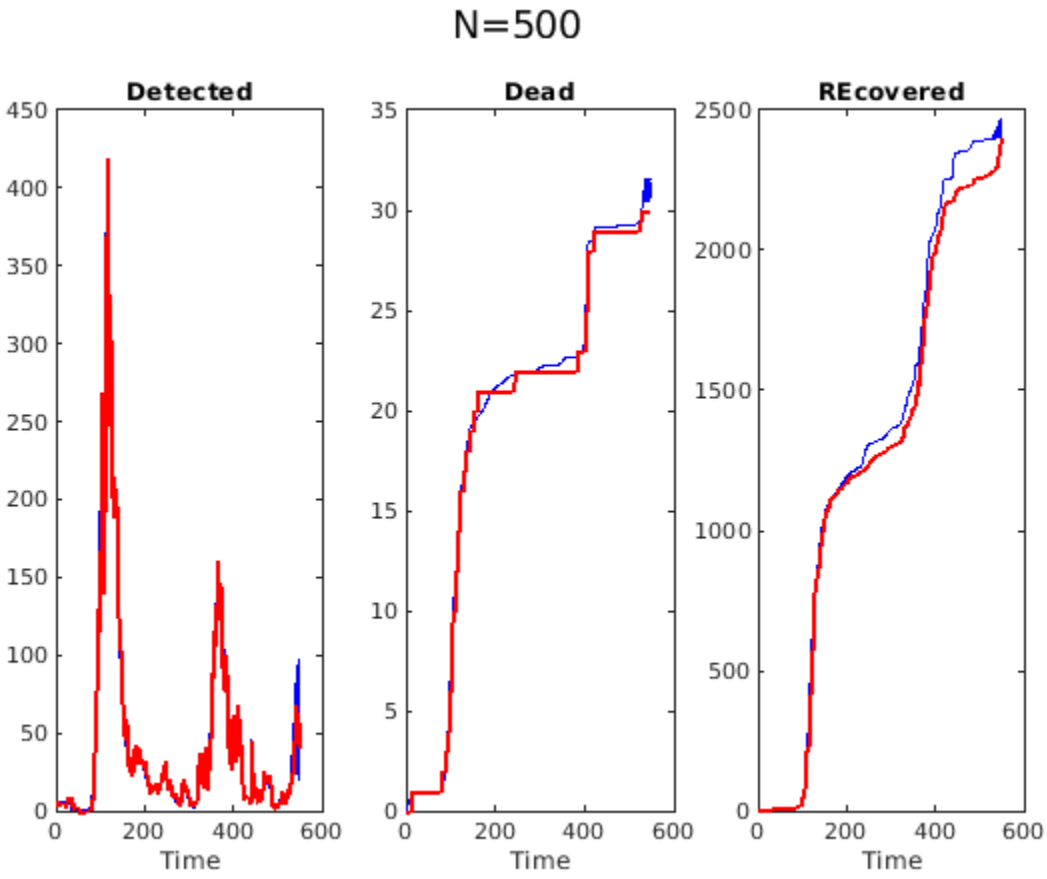
## 26.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 26.4. Uncertainty analisys



# Chapter 27. Extension number27

## 27.1. Basic information

The extension to be validated consists of the time series from the data549 to the 558. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

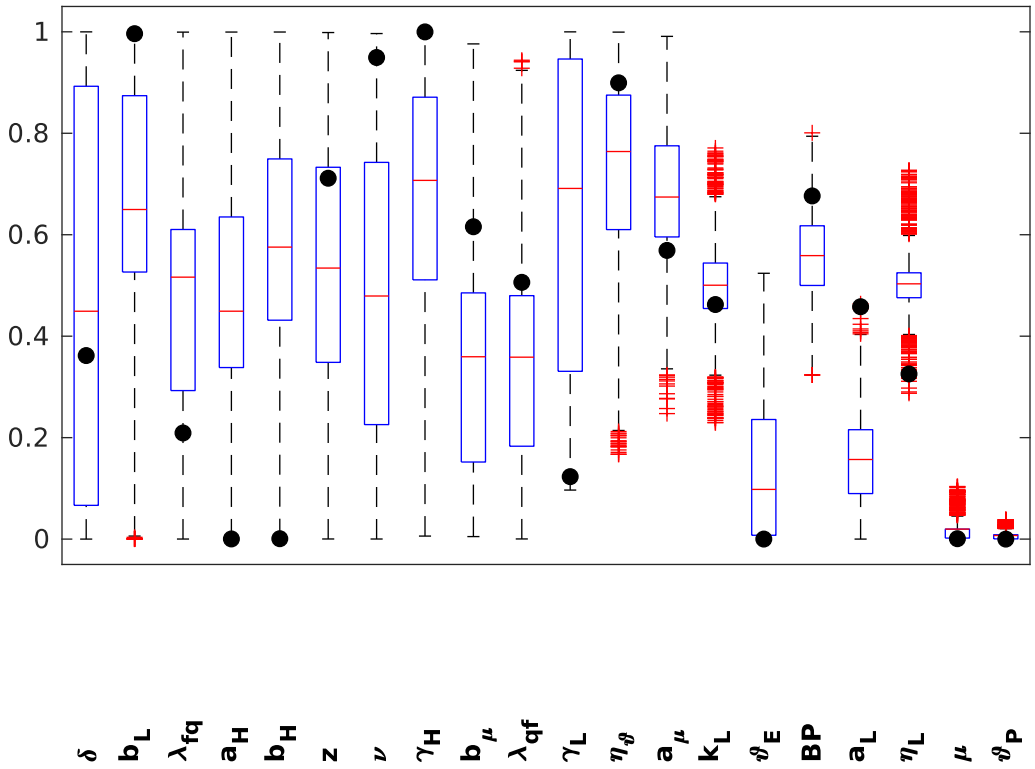
## 27.2. Estimated parameters with their intervals

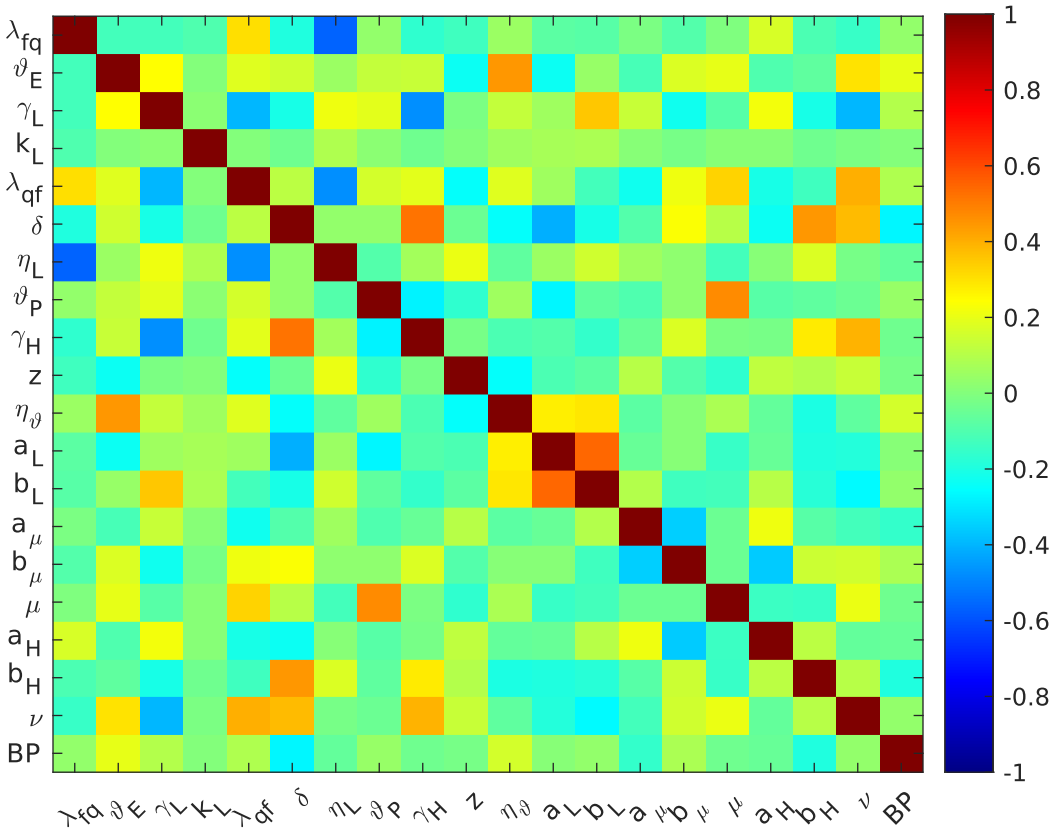
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

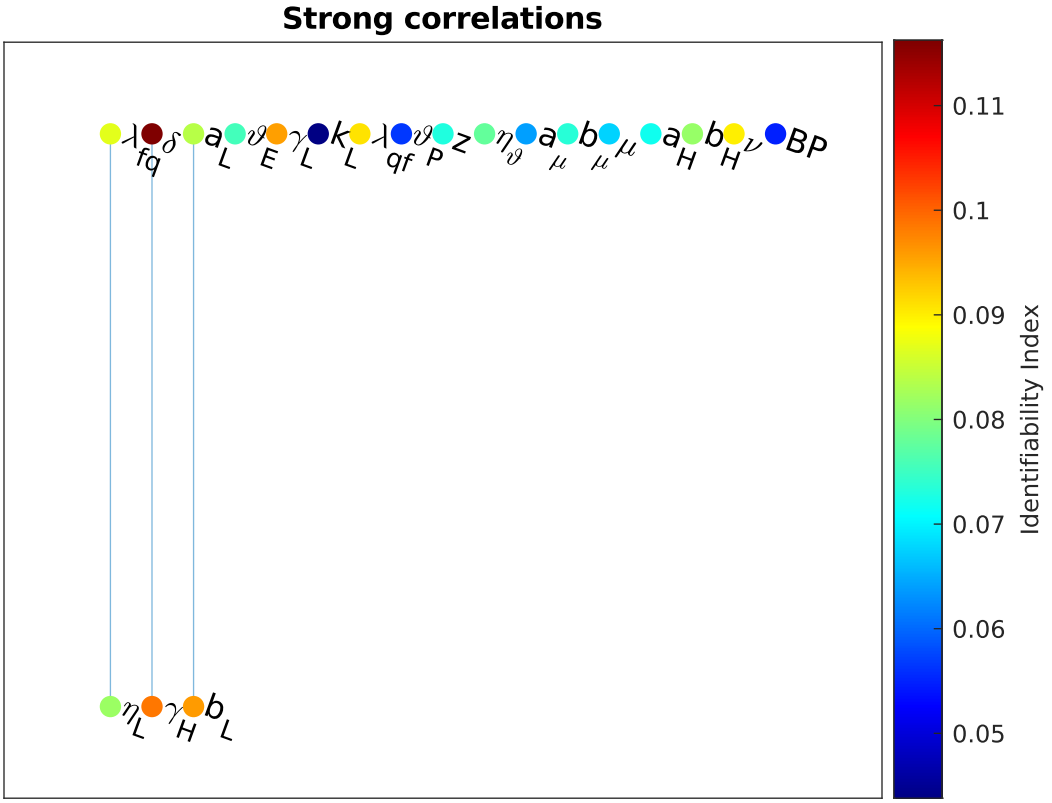
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0.0118' | '0.4707' | '0.5164' | '0.2092' | '0.087' |
| **\vartheta_E** | '0' | '0.0002' | '0.0982' | '0.0001' | '0.0758' |
| **\gamma_L** | '0.111' | '0.2902' | '0.6913' | '0.1231' | '0.0957' |
| **k_L** | '1' | '10' | '5.5042' | '5.1616' | '0.0438' |
| **\lambda_{qf}** | '0' | '1' | '0.3587' | '0.5062' | '0.0908' |
| **\delta** | '0' | '0.0684' | '0.0674' | '0.0543' | '0.1163' |
| **\eta_L** | '0' | '0.7326' | '0.5032' | '0.3256' | '0.082' |
| **\vartheta_P** | '0' | '0' | '0.0071' | '0' | '0.0566' |
| **\gamma_H** | '0.0002' | '1' | '0.7071' | '0.9998' | '0.0984' |
| **z** | '0' | '30' | '16.0283' | '21.3409' | '0.073' |
| **\eta_\vartheta** | '0.4377' | '1' | '0.7638' | '0.8994' | '0.0778' |
| **a_L** | '4.7804' | '7.4661' | '3.1974' | '7.4132' | '0.0839' |
| **b_L** | '8.6026' | '15' | '10.0961' | '14.9486' | '0.0959' |
| **a_\mu** | '1.249' | '13.4512' | '10.4379' | '8.9674' | '0.0641' |
| **b_\mu** | '1' | '15' | '6.0324' | '9.6203' | '0.0737' |
| **\mu** | '0' | '1' | '0.0197' | '0.0008' | '0.0678' |
| **a_H** | '1' | '15' | '7.2896' | '1.0043' | '0.0718' |
| **b_H** | '1' | '15' | '9.0583' | '1.0109' | '0.0816' |
| **\nu** | '92.5374' | '500' | '239.6061' | '474.6741' | '0.09' |
| **BP** | '542.4536' | '546.9788' | '540.5' | '542.5002' | '0.055' |

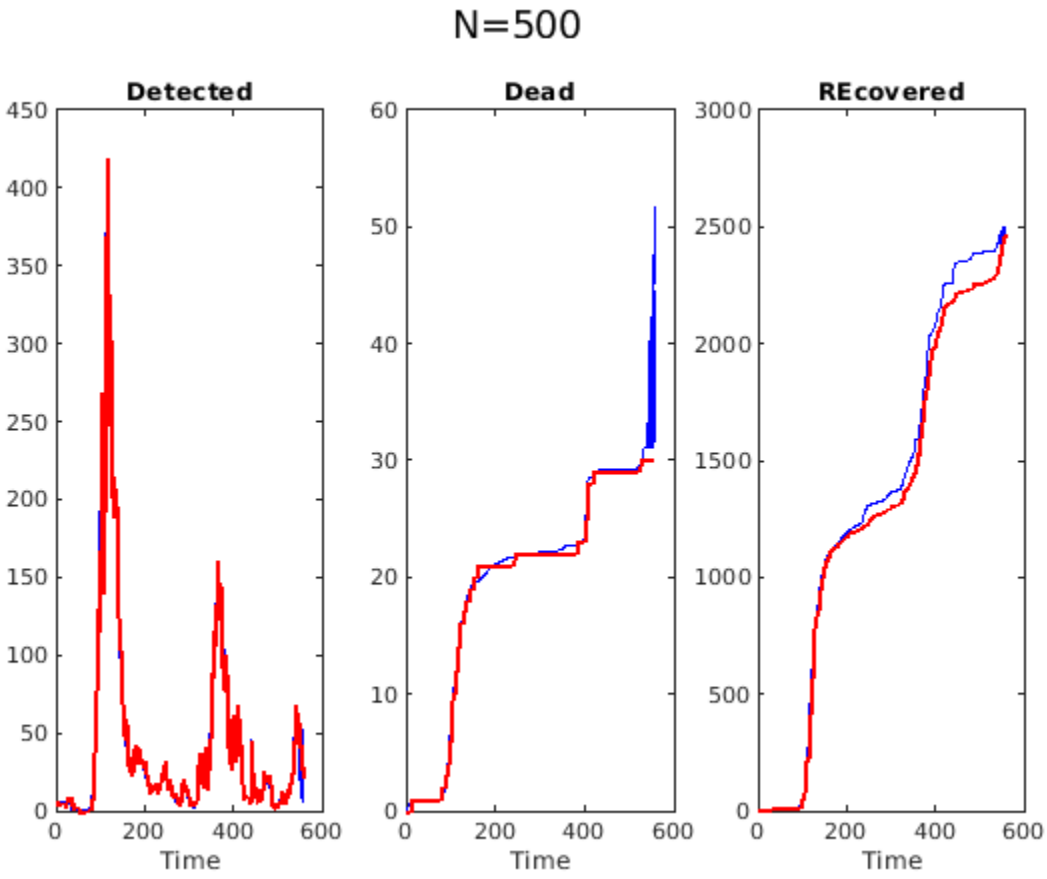
## 27.3. Identifiability analisys




λfq
ϑE
γL
kL
λqf
δ
ηL
ϑP
γH
z
ηϑ
aL
bL
aμ
bμ
μ
aH
bH
ν
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
Identifiability Index
0.11
0.1
0.09
0.08
0.07
0.06
0.05

## 27.4. Uncertainty analisys



# Chapter 28. Extension number28

## 28.1. Basic information

The extension to be validated consists of the time series from the data558 to the 661. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

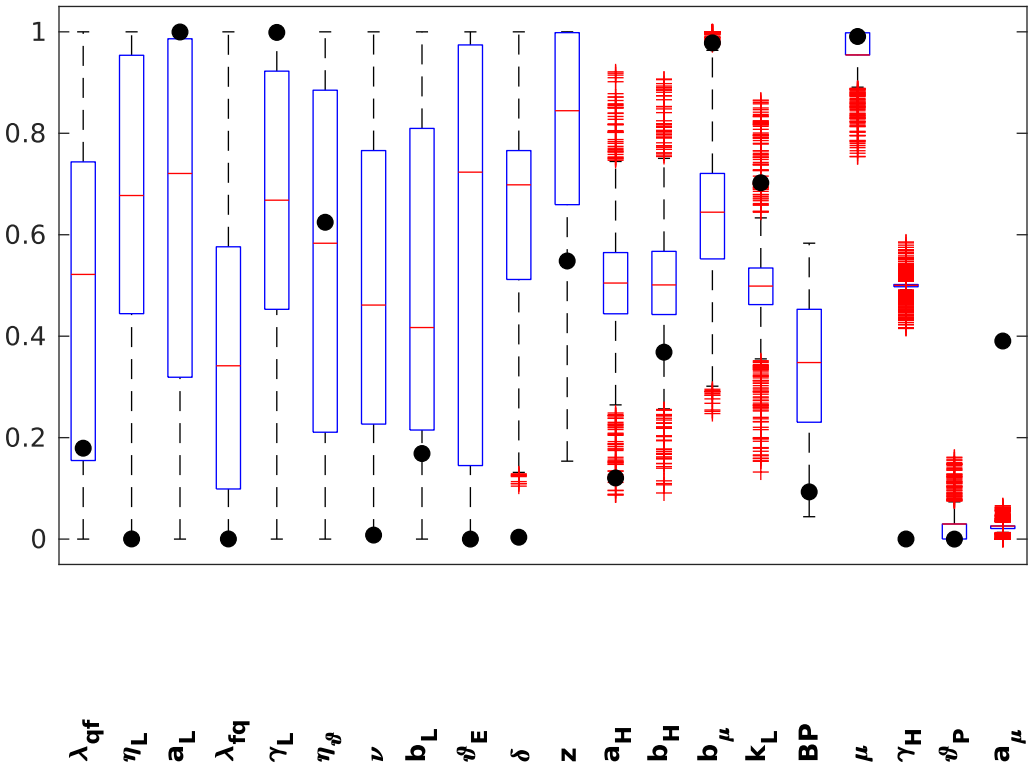
## 28.2. Estimated parameters with their intervals

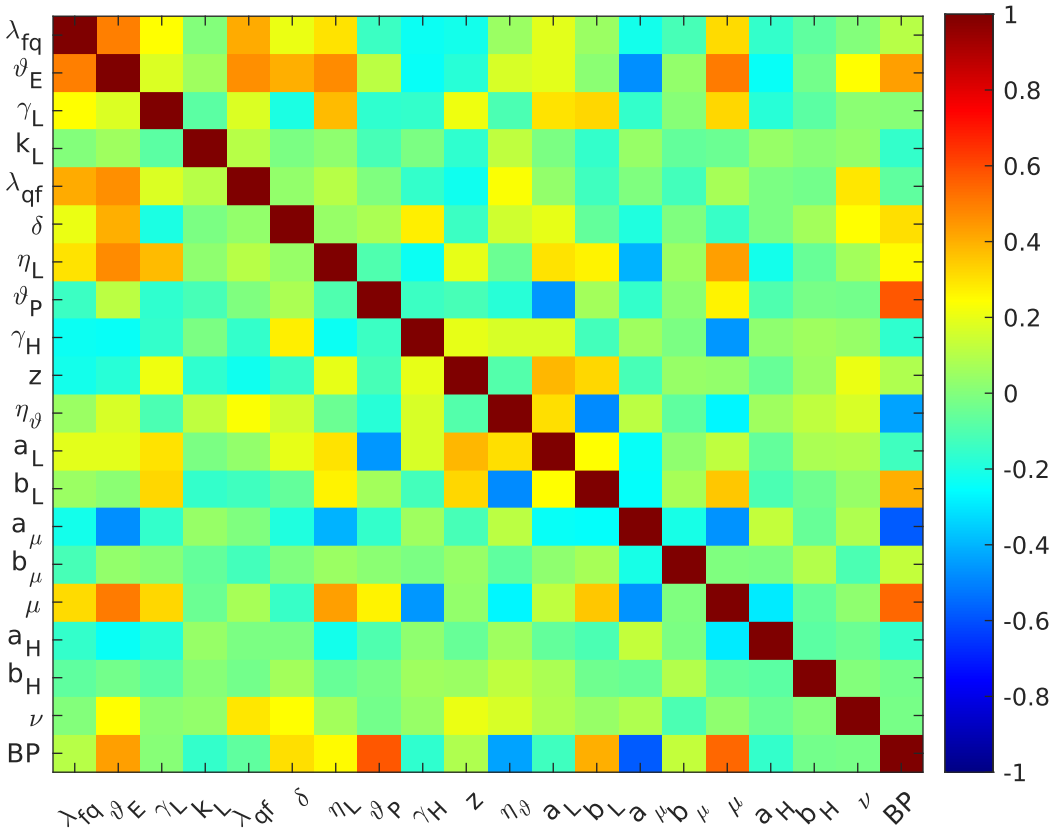
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

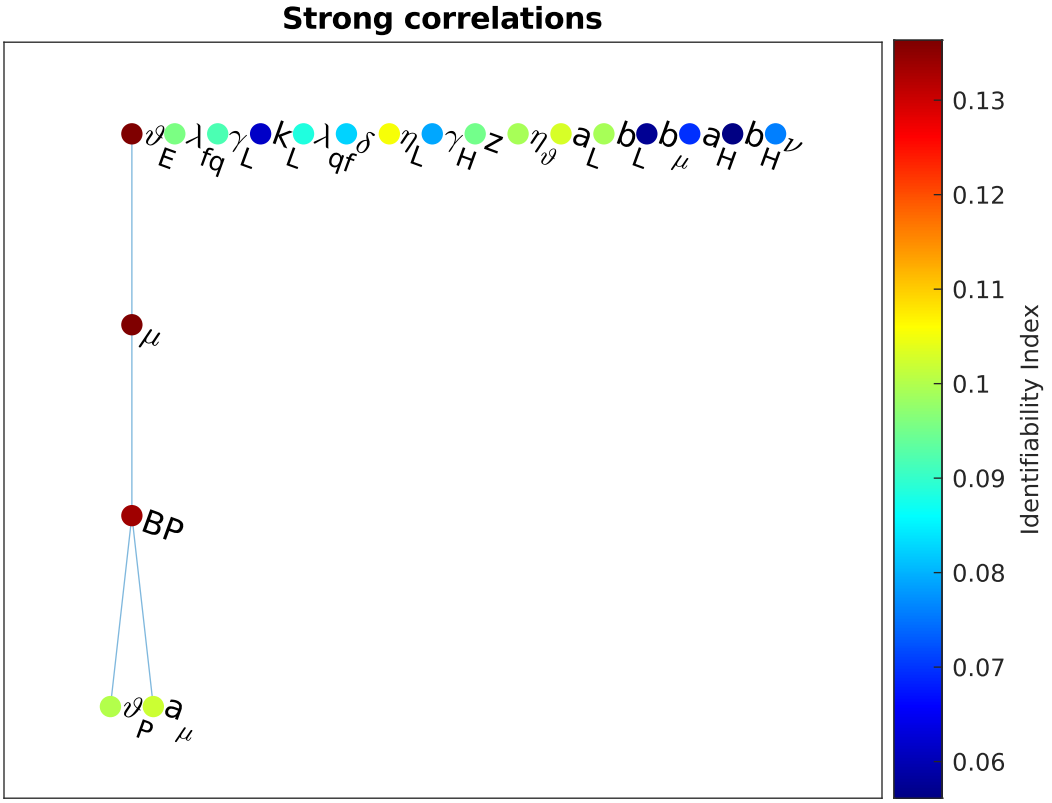
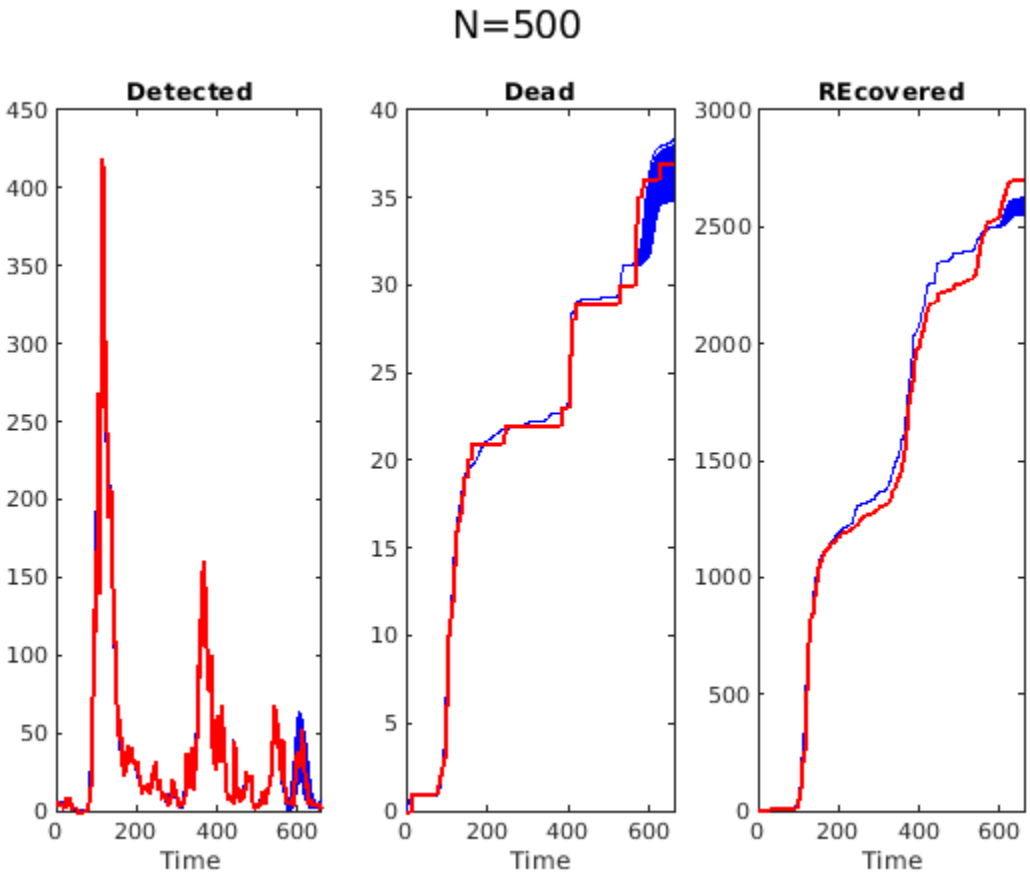
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|---|---|---|---|---|---|
| **\lambda_{fq}** | '0' | '0.0004' | '0.3417' | '0.0003' | '0.0959' |
| **\vartheta_E** | '0' | '0' | '0.7234' | '0' | '0.1363' |
| **\gamma_L** | '0.5933' | '1' | '0.6681' | '0.9988' | '0.0919' |
| **k_L** | '3.0518' | '7.9726' | '5.4889' | '7.3217' | '0.0616' |
| **\lambda_{qf}** | '0.0872' | '0.8583' | '0.5218' | '0.1792' | '0.0886' |
| **\delta** | '0.0005' | '0.0006' | '0.1048' | '0.0006' | '0.0826' |
| **\eta_L** | '0' | '0.0006' | '0.6773' | '0.0003' | '0.1054' |
| **\vartheta_P** | '0' | '0' | '0.0298' | '0' | '0.1001' |
| **\gamma_H** | '0' | '0.0003' | '0.5003' | '0.0002' | '0.0791' |
| **z** | '15.5755' | '22.877' | '25.3344' | '16.4482' | '0.0952' |
| **\eta_\vartheta** | '0.6105' | '0.6466' | '0.5832' | '0.6246' | '0.0993' |
| **a_L** | '14.6616' | '15' | '11.0907' | '14.9956' | '0.103' |
| **b_L** | '3.2304' | '3.6881' | '6.8388' | '3.3618' | '0.0993' |
| **a_\mu** | '4.2077' | '10.3856' | '1.3597' | '6.4669' | '0.1021' |
| **b_\mu** | '5.4417' | '15' | '10.0223' | '14.6943' | '0.0577' |
| **\mu** | '0.2415' | '1' | '0.9544' | '0.9908' | '0.1361' |
| **a_H** | '2.6809' | '5.9109' | '8.0668' | '2.6868' | '0.0698' |
| **b_H** | '4.246' | '7.0208' | '8.0149' | '6.1587' | '0.0561' |
| **\nu** | '3.213' | '7.2929' | '230.682' | '3.9575' | '0.076' |
| **BP** | '557.9957' | '564.7486' | '584.5' | '558.4952' | '0.1338' |

## 28.3. Identifiability analisys




$\lambda_{fq}$
$\vartheta_E$
$\gamma_L$
$k_L$
$\lambda_{qf}$
$\delta$
$\eta_L$
$\vartheta_P$
$\gamma_H$
z
$\eta_\vartheta$
$a_L$
$b_L$
$a_\mu$
$b_\mu$
$\mu$
$a_H$
$b_H$
$\nu$
BP
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Strong correlations
$\vartheta_E$ $\lambda_{fq}$ $\gamma_L$ $k_L$ $\lambda_{qf}$ $\delta$ $\eta_L$ $\gamma_H$ $z$ $\eta_\vartheta$ $a_L$ $b_L$ $b_\mu$ $a_H$ $b_H$ $\nu$
$\mu$
$BP$
$\vartheta_P$ $a_\mu$
Identifiability Index
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06

## 28.4. Uncertainty analisys