

Validation process for META

The epidemiology research group, EAFIT

06-Apr-2022

Table of Contents

| | |
|--|----|
| Chapter 1. Extension number1 | 1 |
| 1.1. Basic information | 1 |
| 1.2. Estimated parameters with their intervals | 1 |
| 1.3. Identifiability analysis | 2 |
| 1.4. Uncertainty analysis | 5 |
| Chapter 2. Extension number2 | 6 |
| 2.1. Basic information | 6 |
| 2.2. Estimated parameters with their intervals | 6 |
| 2.3. Identifiability analysis | 7 |
| 2.4. Uncertainty analysis | 10 |
| Chapter 3. Extension number3 | 11 |
| 3.1. Basic information | 11 |
| 3.2. Estimated parameters with their intervals | 11 |
| 3.3. Identifiability analysis | 12 |
| 3.4. Uncertainty analysis | 15 |
| Chapter 4. Extension number4 | 16 |
| 4.1. Basic information | 16 |
| 4.2. Estimated parameters with their intervals | 16 |
| 4.3. Identifiability analysis | 17 |
| 4.4. Uncertainty analysis | 20 |
| Chapter 5. Extension number5 | 21 |
| 5.1. Basic information | 21 |
| 5.2. Estimated parameters with their intervals | 21 |
| 5.3. Identifiability analysis | 22 |
| 5.4. Uncertainty analysis | 25 |
| Chapter 6. Extension number6 | 26 |
| 6.1. Basic information | 26 |
| 6.2. Estimated parameters with their intervals | 26 |
| 6.3. Identifiability analysis | 27 |
| 6.4. Uncertainty analysis | 30 |
| Chapter 7. Extension number7 | 31 |
| 7.1. Basic information | 31 |
| 7.2. Estimated parameters with their intervals | 31 |
| 7.3. Identifiability analysis | 32 |
| 7.4. Uncertainty analysis | 35 |
| Chapter 8. Extension number8 | 36 |
| 8.1. Basic information | 36 |
| 8.2. Estimated parameters with their intervals | 36 |
| 8.3. Identifiability analysis | 37 |
| 8.4. Uncertainty analysis | 40 |
| Chapter 9. Extension number9 | 41 |
| 9.1. Basic information | 41 |
| 9.2. Estimated parameters with their intervals | 41 |

| | |
|---|----|
| 9.3. Identifiability analysis | 42 |
| 9.4. Uncertainty analysis | 45 |
| Chapter 10. Extension number10 | 46 |
| 10.1. Basic information | 46 |
| 10.2. Estimated parameters with their intervals | 46 |
| 10.3. Identifiability analysis | 47 |
| 10.4. Uncertainty analysis | 50 |
| Chapter 11. Extension number11 | 51 |
| 11.1. Basic information | 51 |
| 11.2. Estimated parameters with their intervals | 51 |
| 11.3. Identifiability analysis | 52 |
| 11.4. Uncertainty analysis | 55 |
| Chapter 12. Extension number12 | 56 |
| 12.1. Basic information | 56 |
| 12.2. Estimated parameters with their intervals | 56 |
| 12.3. Identifiability analysis | 57 |
| 12.4. Uncertainty analysis | 60 |
| Chapter 13. Extension number13 | 61 |
| 13.1. Basic information | 61 |
| 13.2. Estimated parameters with their intervals | 61 |
| 13.3. Identifiability analysis | 62 |
| 13.4. Uncertainty analysis | 65 |
| Chapter 14. Extension number14 | 66 |
| 14.1. Basic information | 66 |
| 14.2. Estimated parameters with their intervals | 66 |
| 14.3. Identifiability analysis | 67 |
| 14.4. Uncertainty analysis | 70 |
| Chapter 15. Extension number15 | 71 |
| 15.1. Basic information | 71 |
| 15.2. Estimated parameters with their intervals | 71 |
| 15.3. Identifiability analysis | 72 |
| 15.4. Uncertainty analysis | 75 |
| Chapter 16. Extension number16 | 76 |
| 16.1. Basic information | 76 |
| 16.2. Estimated parameters with their intervals | 76 |
| 16.3. Identifiability analysis | 77 |
| 16.4. Uncertainty analysis | 80 |

Chapter 1. Extension number1

1.1. Basic information

The extension to be validated consists of the time series from the data1 to the 50. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

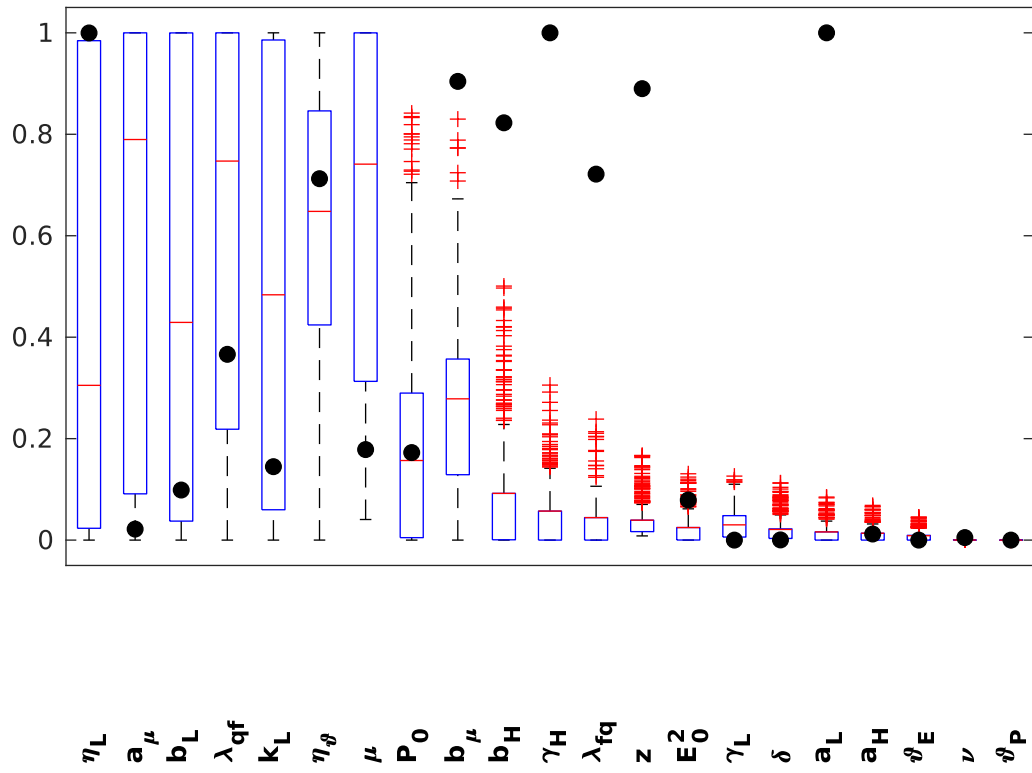
1.2. Estimated parameters with their intervals

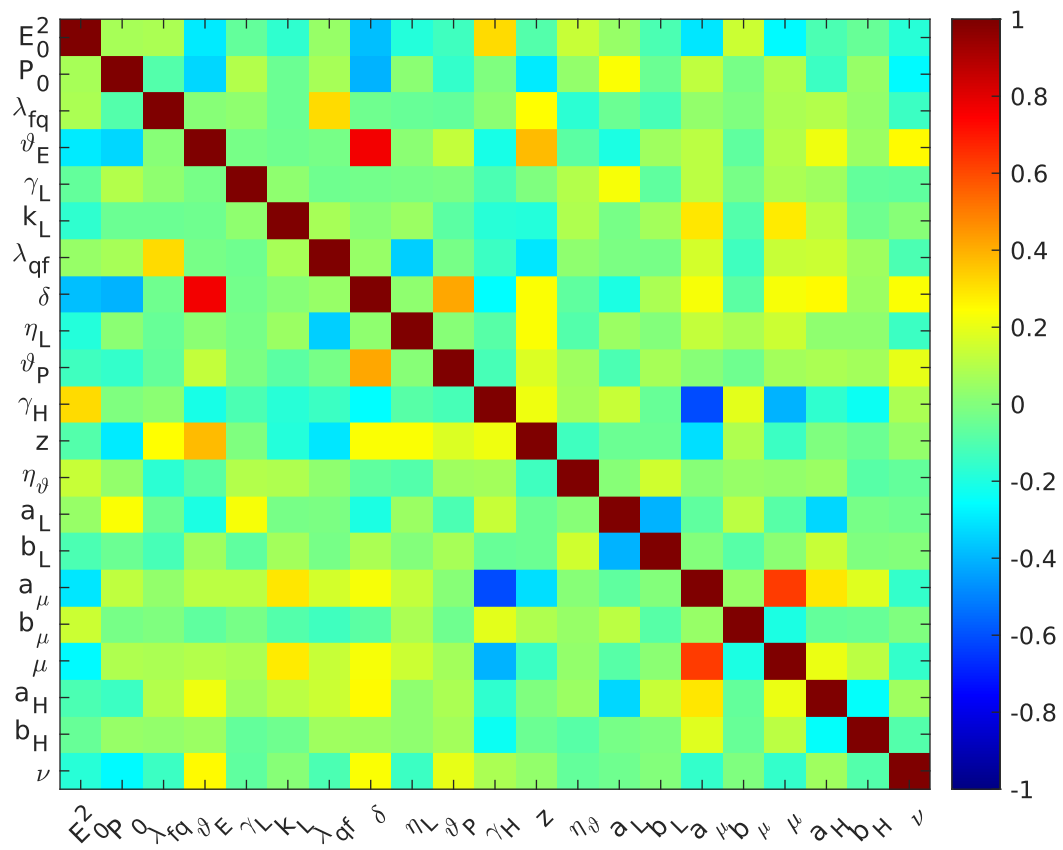
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

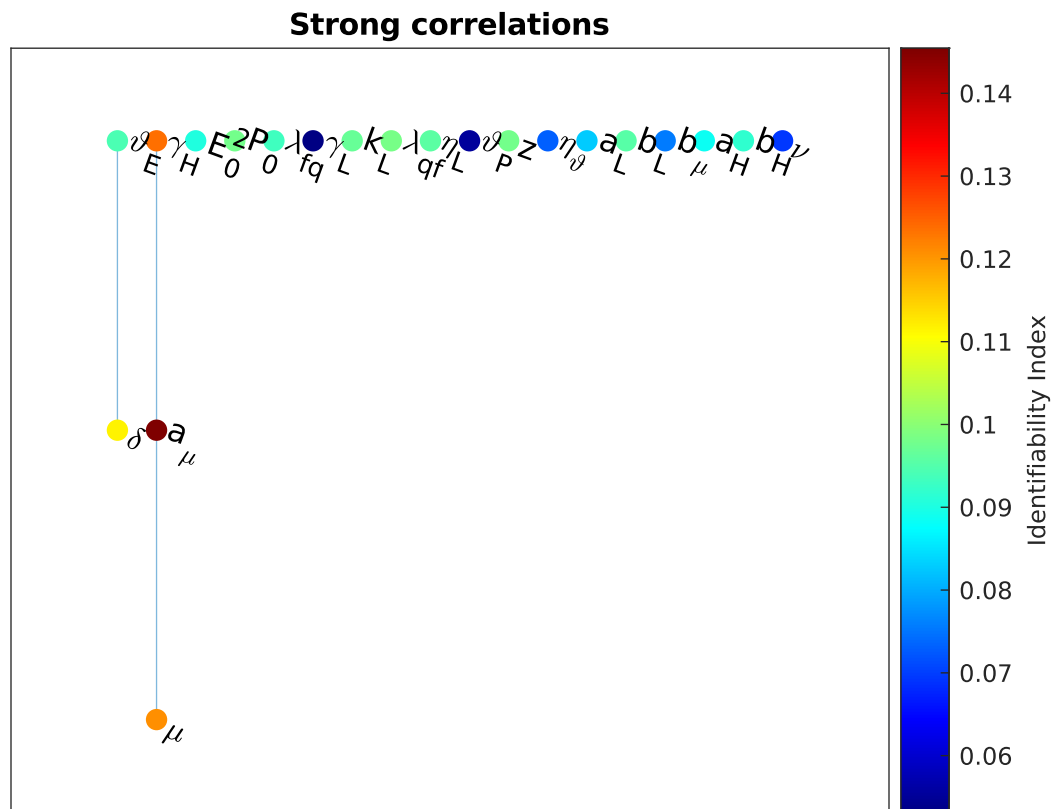
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|------------------|-----------|------------|-----------|------------|----------|
| E^2_0 | '42.5037' | '355.7281' | '49.5101' | '158.1014' | '0.0906' |
| P_0 | '67.6125' | '188.2628' | '62.7559' | '69.0129' | '0.098' |
| \lambda_{fq} | '0.6137' | '0.7376' | '0.0443' | '0.7214' | '0.0933' |
| \vartheta_E | '0' | '0' | '0.0087' | '0' | '0.0944' |
| \gamma_L | '0' | '0' | '0.0301' | '0' | '0.0532' |
| k_L | '1' | '10' | '5.3521' | '2.3028' | '0.097' |
| \lambda_{qf} | '0.3609' | '0.4246' | '0.7472' | '0.3662' | '0.0983' |
| \delta | '0' | '0.0001' | '0.0031' | '0.0001' | '0.1118' |
| \eta_L | '0.6125' | '1' | '0.3051' | '0.9997' | '0.0959' |
| \vartheta_P | '0' | '0' | '0' | '0' | '0.0556' |
| \gamma_H | '0.7344' | '1' | '0.0572' | '1' | '0.1238' |
| z | '21.69' | '28.1867' | '1.1786' | '26.6974' | '0.0982' |
| \eta_{\vartheta} | '0.7062' | '0.7234' | '0.648' | '0.7124' | '0.0731' |
| a_L | '6.4025' | '15' | '1.2261' | '15' | '0.0829' |
| b_L | '1.591' | '12.97' | '7.008' | '2.3817' | '0.0953' |
| a_{\mu} | '1.0398' | '1.5189' | '12.0554' | '1.3036' | '0.1454' |
| b_{\mu} | '5.6206' | '15' | '4.8989' | '13.6598' | '0.0757' |
| \mu | '0.1356' | '0.181' | '0.7411' | '0.1784' | '0.1206' |
| a_H | '1.0476' | '1.7067' | '1.1896' | '1.168' | '0.0887' |
| b_H | '5.2375' | '15' | '2.2895' | '12.5168' | '0.0918' |
| \nu | '2.2537' | '3.6328' | '0.0921' | '2.4751' | '0.0696' |

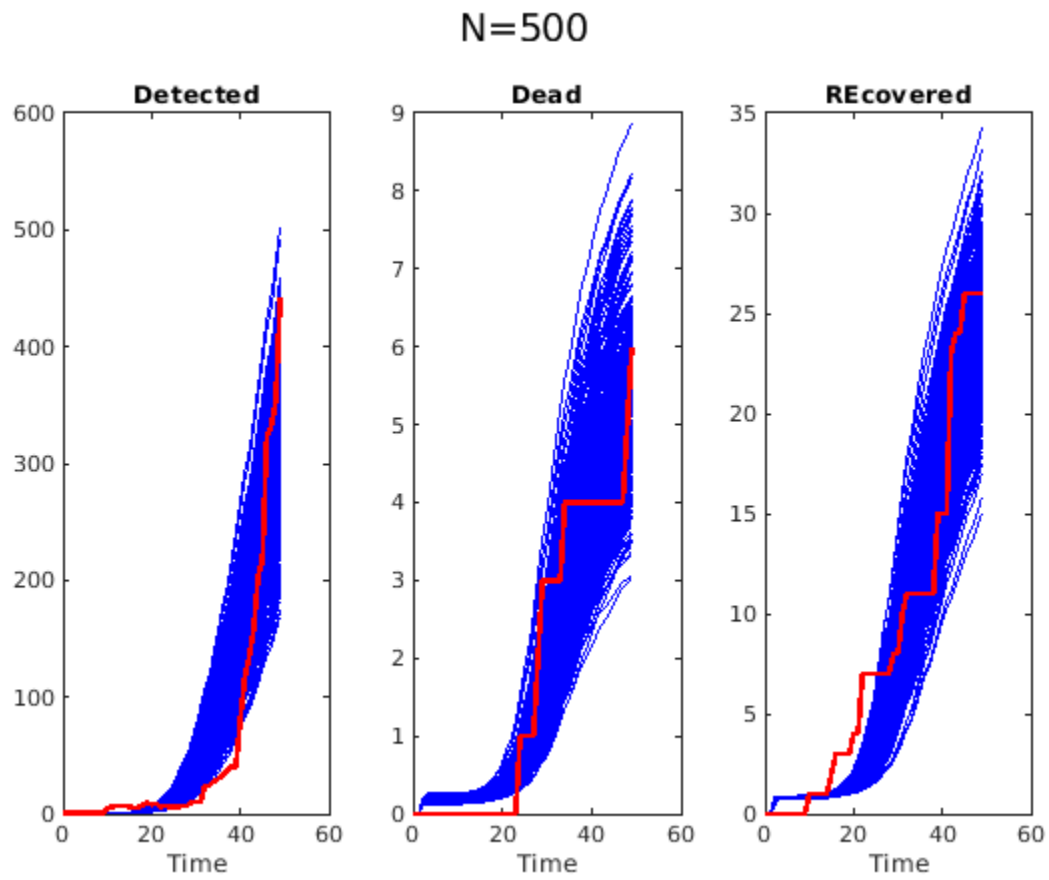
1.3. Identifiability analysis







1.4. Uncertainty analysis



Chapter 2. Extension number2

2.1. Basic information

The extension to be validated consists of the time series from the data50 to the 80. The status of the validation is: COMPLETED.

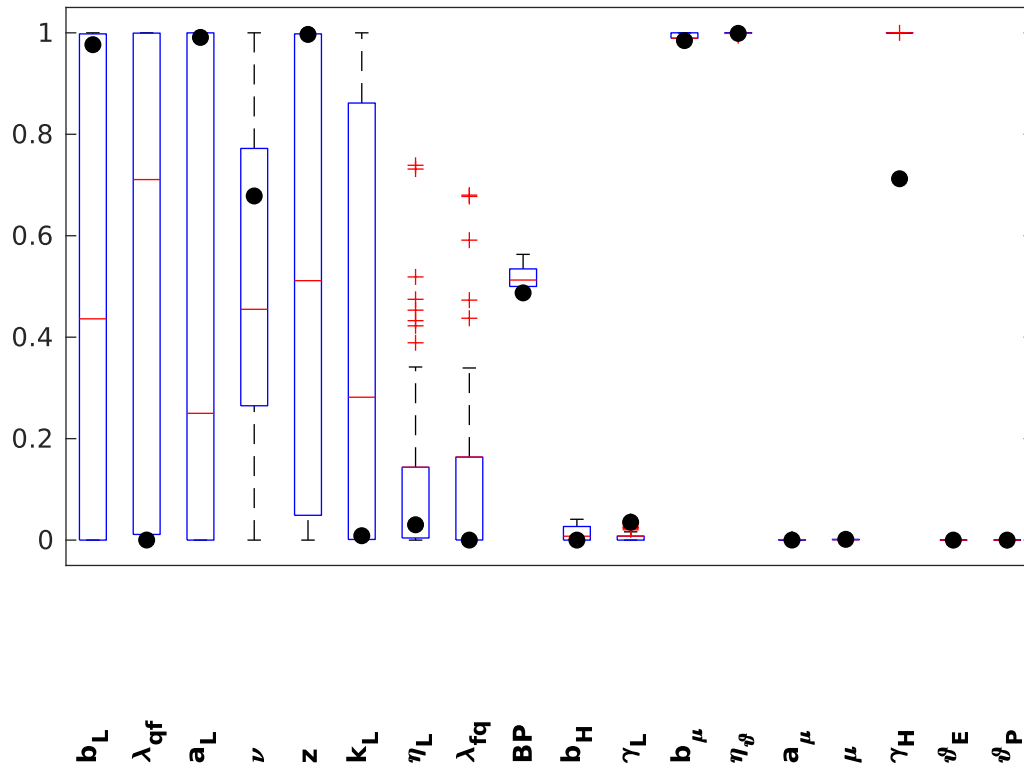
The number of estimations needed to perform the validation was10000.

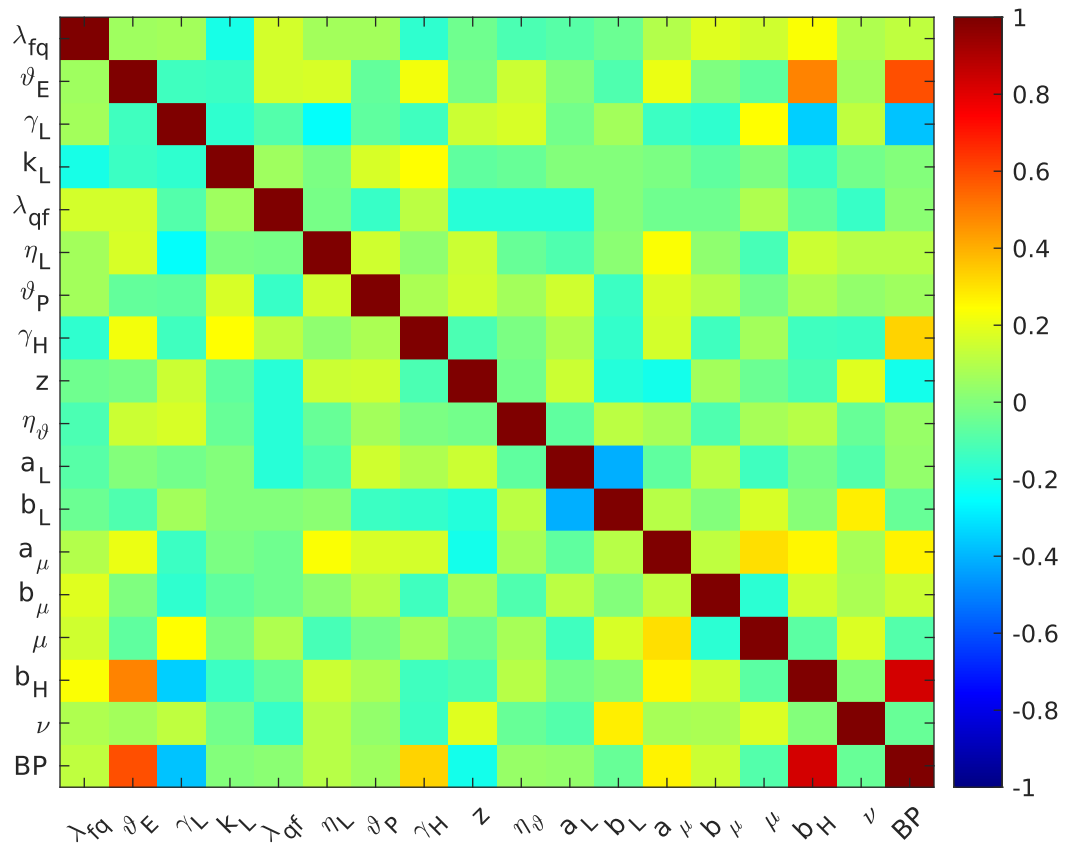
2.2. Estimated parameters with their intervals

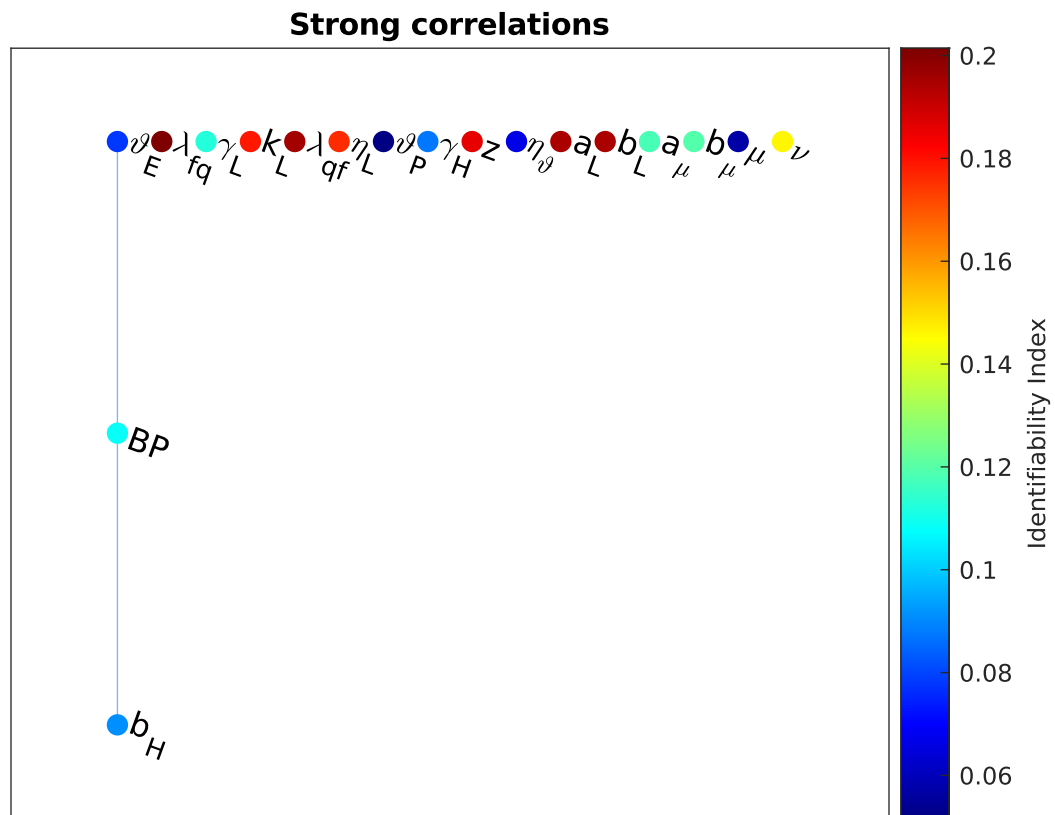
It was necessary to fix 2 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|------------|----------|
| λ_{fq} | '0.0168' | '0.3106' | '0.1637' | '0' | '0.2014' |
| ϑ_E | '0' | '0.0001' | '0' | '0' | '0.0783' |
| γ_L | '0' | '0.0957' | '0.0079' | '0.0353' | '0.1128' |
| k_L | '2.3482' | '4.7216' | '3.5349' | '1.0776' | '0.1787' |
| λ_{qf} | '0.5656' | '0.8559' | '0.7107' | '0.0001' | '0.1959' |
| δ | '0.0053' | '0.0053' | '0.0053' | '0.0053' | '0' |
| η_L | '0.0198' | '0.2675' | '0.1436' | '0.0302' | '0.1758' |
| ϑ_P | '0' | '0' | '0' | '0' | '0.0517' |
| γ_H | '0.9433' | '1' | '1' | '0.7123' | '0.0879' |
| z | '11.4424' | '19.2436' | '15.343' | '29.9061' | '0.1861' |
| η_{ϑ} | '0.9624' | '1' | '0.999' | '0.999' | '0.0663' |
| a_L | '2.4908' | '6.5066' | '4.4987' | '14.8737' | '0.1949' |
| b_L | '5.1354' | '9.0787' | '7.1071' | '14.6727' | '0.1944' |
| a_{μ} | '1' | '2.5294' | '1.0124' | '1.0013' | '0.1179' |
| b_{μ} | '13.0675' | '15' | '14.8513' | '14.7859' | '0.1201' |
| μ | '0' | '0.0027' | '0.0008' | '0.0015' | '0.057' |
| a_H | '15' | '15' | '15' | '15' | '0' |
| b_H | '1.0353' | '1.179' | '1.1072' | '1' | '0.0913' |
| ν | '180.3604' | '274.6082' | '227.4843' | '339.1967' | '0.1459' |
| BP | '40.9733' | '42.0288' | '41.5011' | '39.5' | '0.1084' |

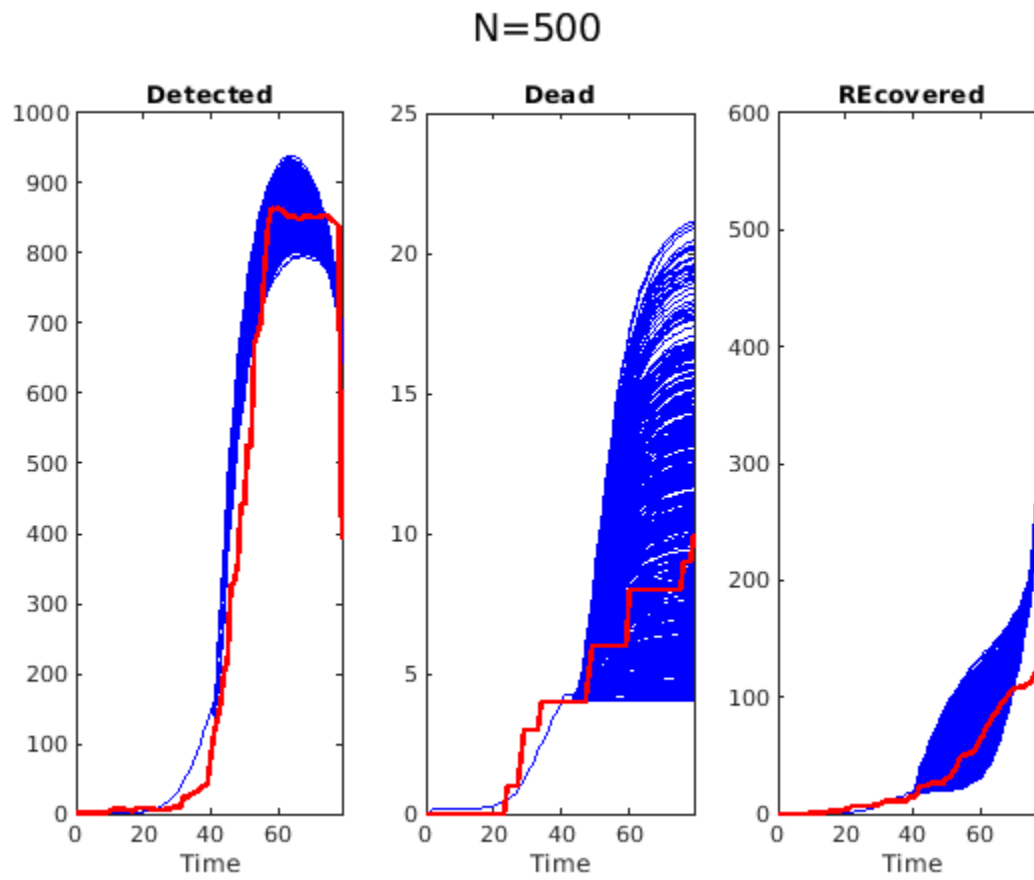
2.3. Identifiability analysys







2.4. Uncertainty analysis



Chapter 3. Extension number3

3.1. Basic information

The extension to be validated consists of the time series from the data80 to the 116. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

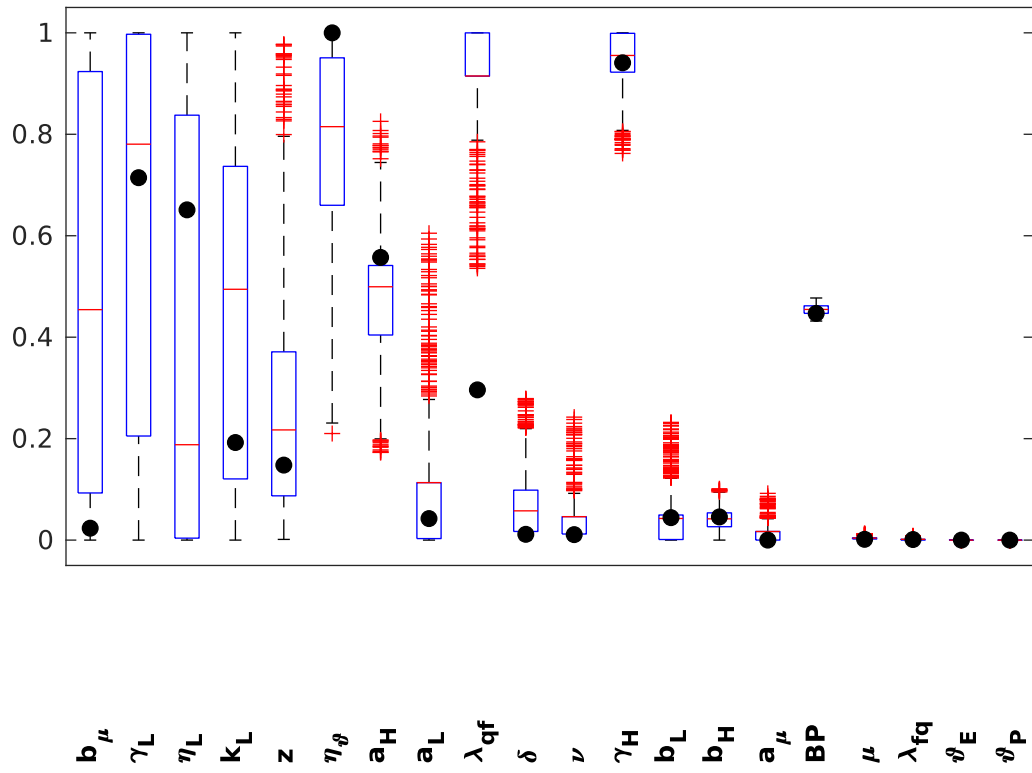
3.2. Estimated parameters with their intervals

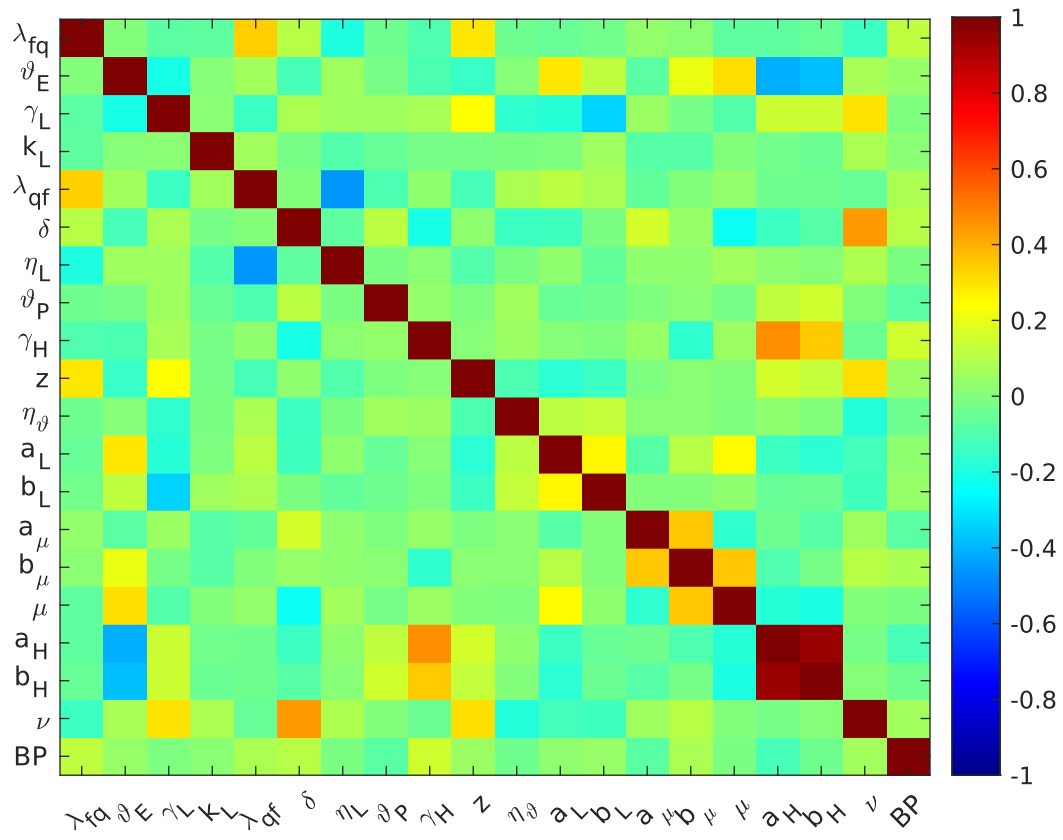
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

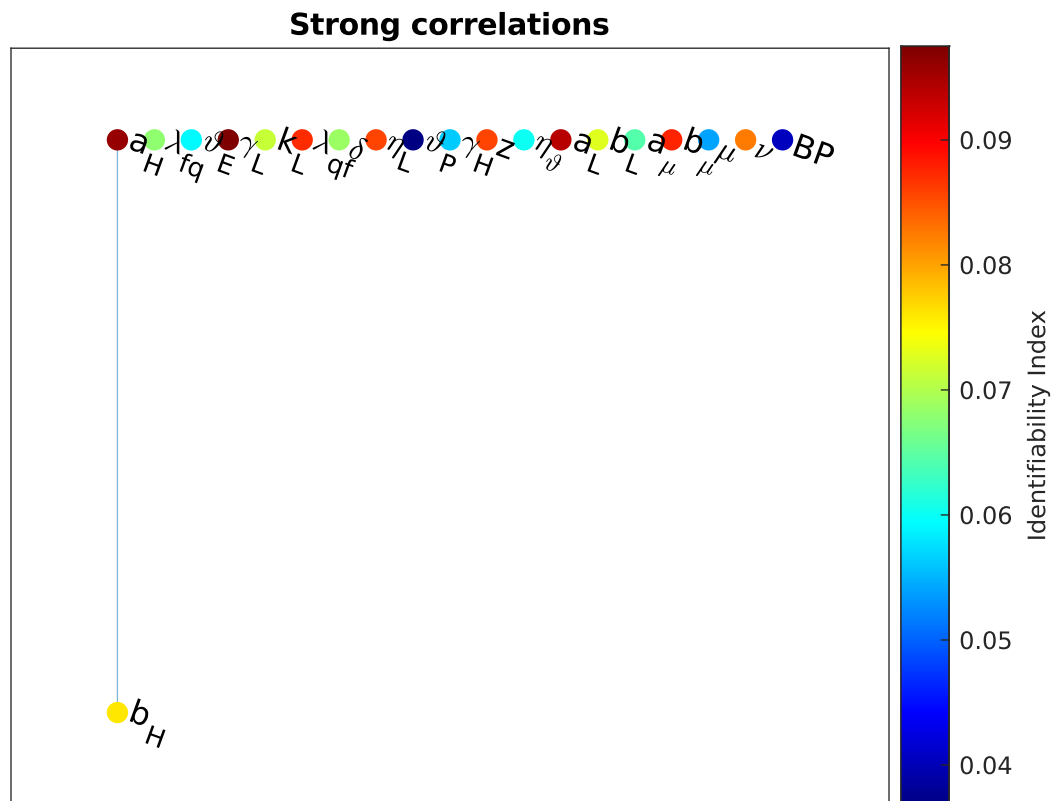
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|-----------|-----------|-----------|-----------|----------|
| λ_{fq} | '0' | '0.0025' | '0.0016' | '0.0011' | '0.0681' |
| ϑ_E | '0' | '0' | '0' | '0' | '0.0592' |
| γ_L | '0' | '1' | '0.7805' | '0.7144' | '0.0975' |
| k_L | '1' | '9.2944' | '5.4501' | '2.7311' | '0.0714' |
| λ_{qf} | '0.1671' | '0.3013' | '0.9146' | '0.2962' | '0.0871' |
| δ | '0.0013' | '0.0018' | '0.0087' | '0.0017' | '0.0686' |
| η_L | '0.4008' | '0.8062' | '0.188' | '0.651' | '0.0858' |
| ϑ_P | '0' | '0' | '0' | '0' | '0.0369' |
| γ_H | '0.7152' | '1' | '0.9553' | '0.9409' | '0.0565' |
| z | '3.1269' | '7.4284' | '6.5227' | '4.4358' | '0.0857' |
| η_{ϑ} | '0.5002' | '1' | '0.815' | '1' | '0.0603' |
| a_L | '1' | '13.768' | '2.586' | '1.594' | '0.094' |
| b_L | '1' | '15' | '1.599' | '1.6196' | '0.0727' |
| a_{μ} | '1' | '11.2767' | '1.2377' | '1.0001' | '0.0644' |
| b_{μ} | '1.2355' | '4.6797' | '7.3602' | '1.3288' | '0.0876' |
| μ | '0.0009' | '0.003' | '0.0039' | '0.0015' | '0.054' |
| a_H | '7.1267' | '10.5933' | '7.9917' | '8.8014' | '0.0959' |
| b_H | '1.3429' | '2.0585' | '1.5872' | '1.6395' | '0.0759' |
| ν | '5.2146' | '8.9245' | '23.1233' | '5.3935' | '0.0823' |
| BP | '76.4956' | '79.4985' | '80.0103' | '79.4947' | '0.0406' |

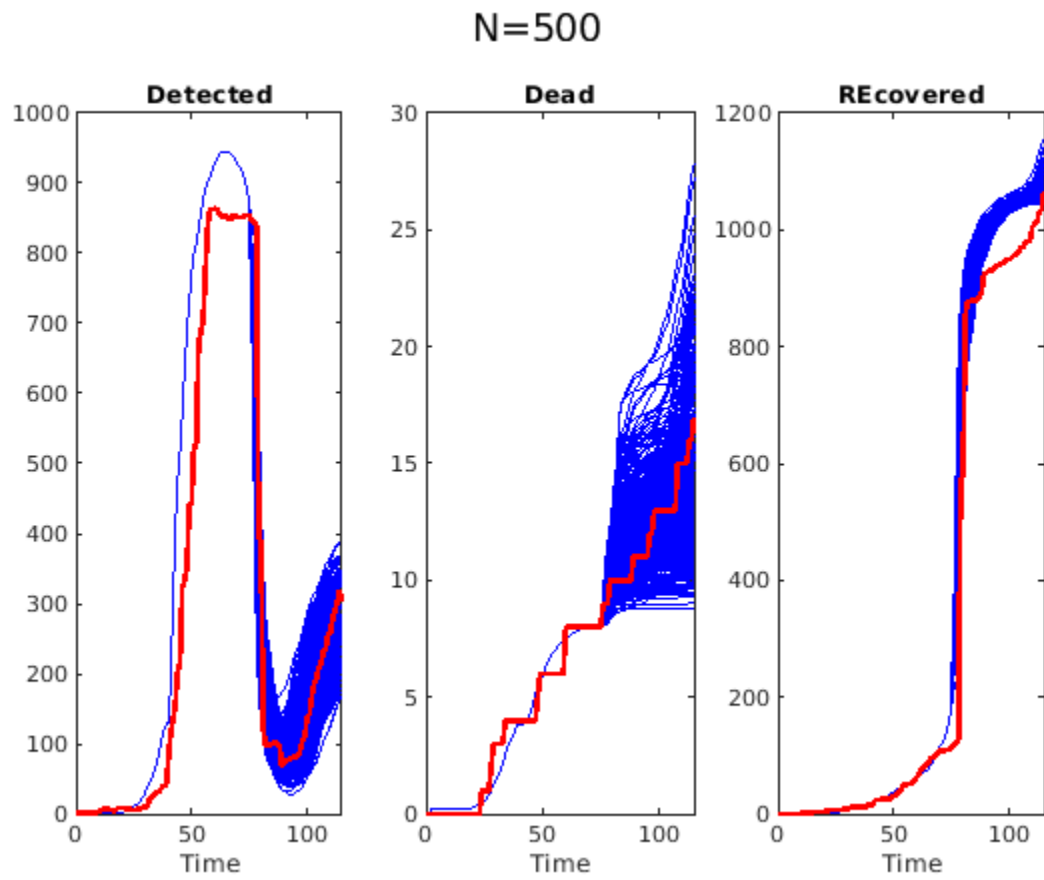
3.3. Identifiability analysis







3.4. Uncertainty analysys



Chapter 4. Extension number4

4.1. Basic information

The extension to be validated consists of the time series from the data116 to the 148. The status of the validation is: COMPLETED.

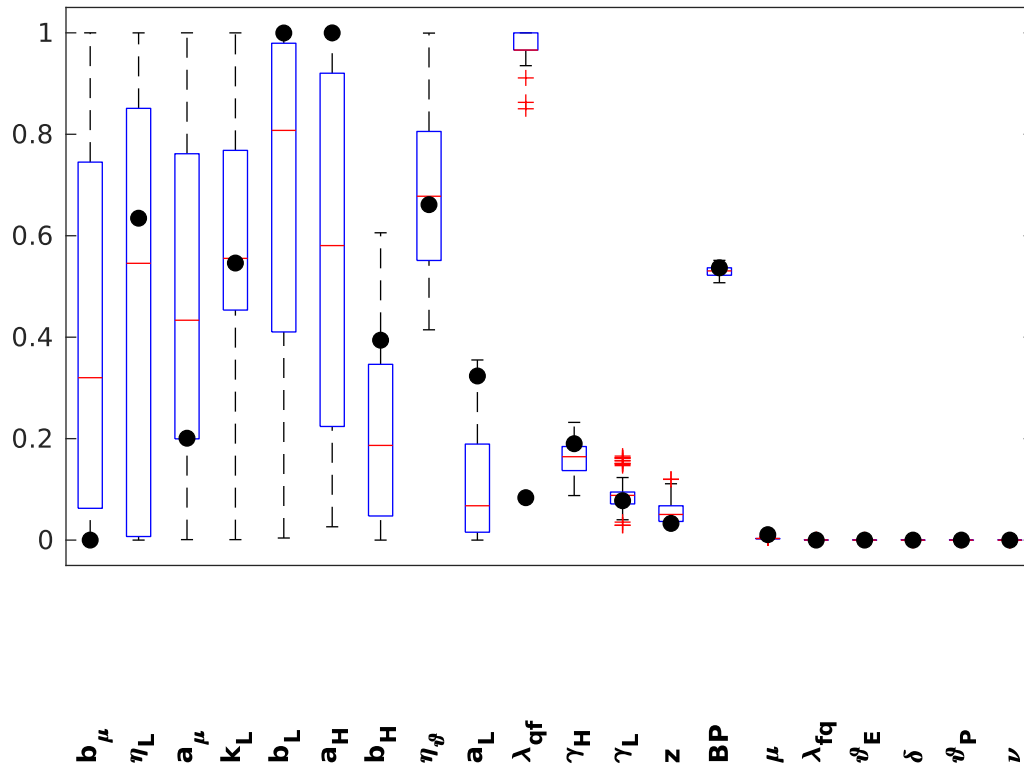
The number of estimations needed to perform the validation was2000.

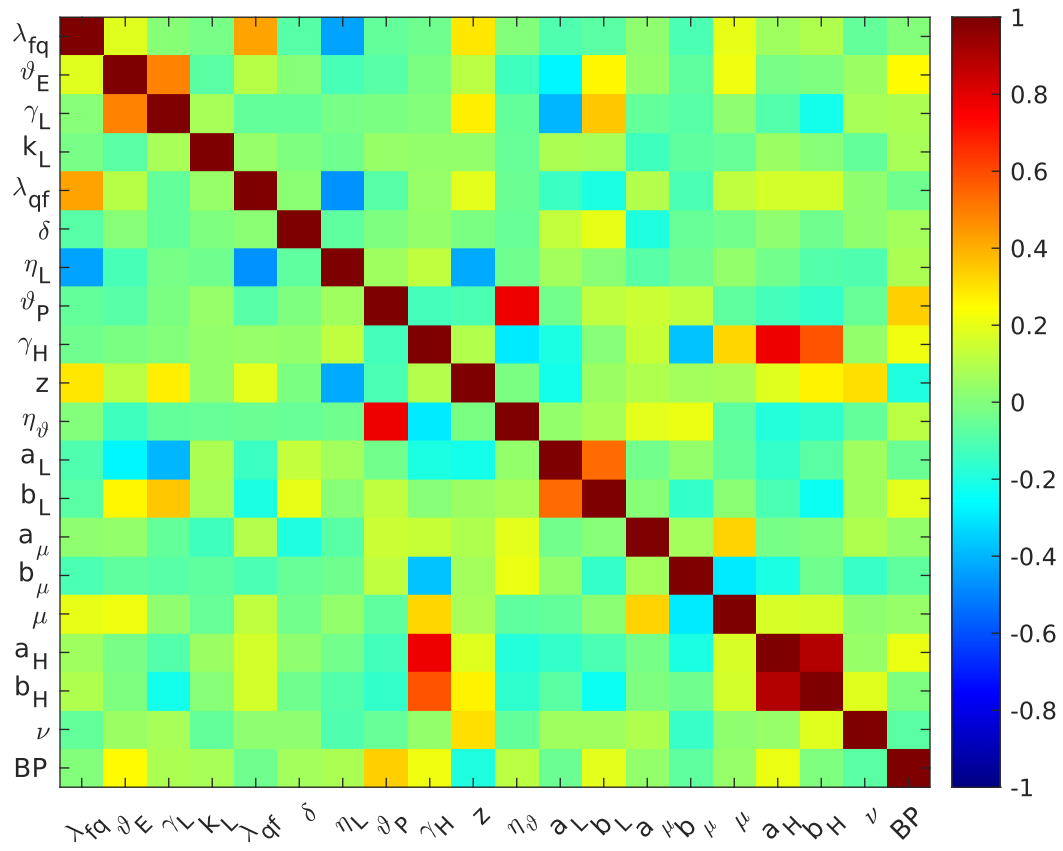
4.2. Estimated parameters with their intervals

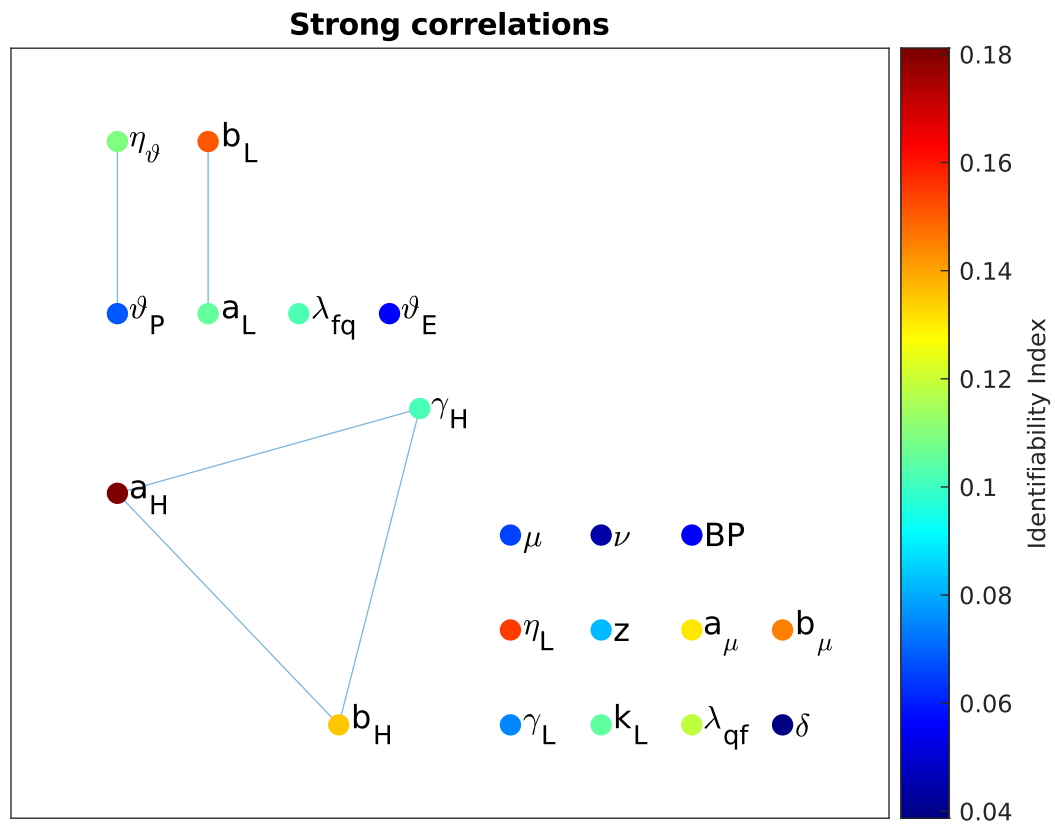
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|-----------|----------|
| λ_{fq} | '0' | '0.0985' | '0.0002' | '0' | '0.1027' |
| ϑ_E | '0' | '0.0003' | '0.0001' | '0' | '0.0563' |
| γ_L | '0.0686' | '0.1077' | '0.0882' | '0.0777' | '0.0749' |
| k_L | '5.3891' | '6.608' | '5.9985' | '5.9155' | '0.1053' |
| λ_{qf} | '0.8755' | '1' | '0.9659' | '0.0836' | '0.1186' |
| δ | '0' | '0' | '0' | '0' | '0.0387' |
| η_L | '0.4447' | '0.6465' | '0.5456' | '0.6346' | '0.1547' |
| ϑ_P | '0' | '0.0001' | '0' | '0' | '0.0687' |
| γ_H | '0.1562' | '0.1736' | '0.1649' | '0.19' | '0.1017' |
| z | '0.9421' | '2.1381' | '1.5401' | '0.9873' | '0.0824' |
| η_{ϑ} | '0.6379' | '0.7178' | '0.6779' | '0.6613' | '0.1095' |
| a_L | '1.4546' | '2.4421' | '1.9483' | '5.5294' | '0.1057' |
| b_L | '11.2014' | '13.4132' | '12.3073' | '14.9953' | '0.1508' |
| a_{μ} | '5.8982' | '8.238' | '7.0681' | '3.8116' | '0.1306' |
| b_{μ} | '4.1971' | '6.7671' | '5.4821' | '1.0003' | '0.1451' |
| μ | '0' | '0.0242' | '0.0032' | '0.0107' | '0.066' |
| a_H | '7.9034' | '10.353' | '9.1282' | '14.9983' | '0.1811' |
| b_H | '3.0031' | '4.2233' | '3.6132' | '6.5173' | '0.1355' |
| ν | '0' | '0.0423' | '0.0022' | '0.0001' | '0.0442' |
| BP | '115.8507' | '116.3804' | '116.1156' | '116.5' | '0.0555' |

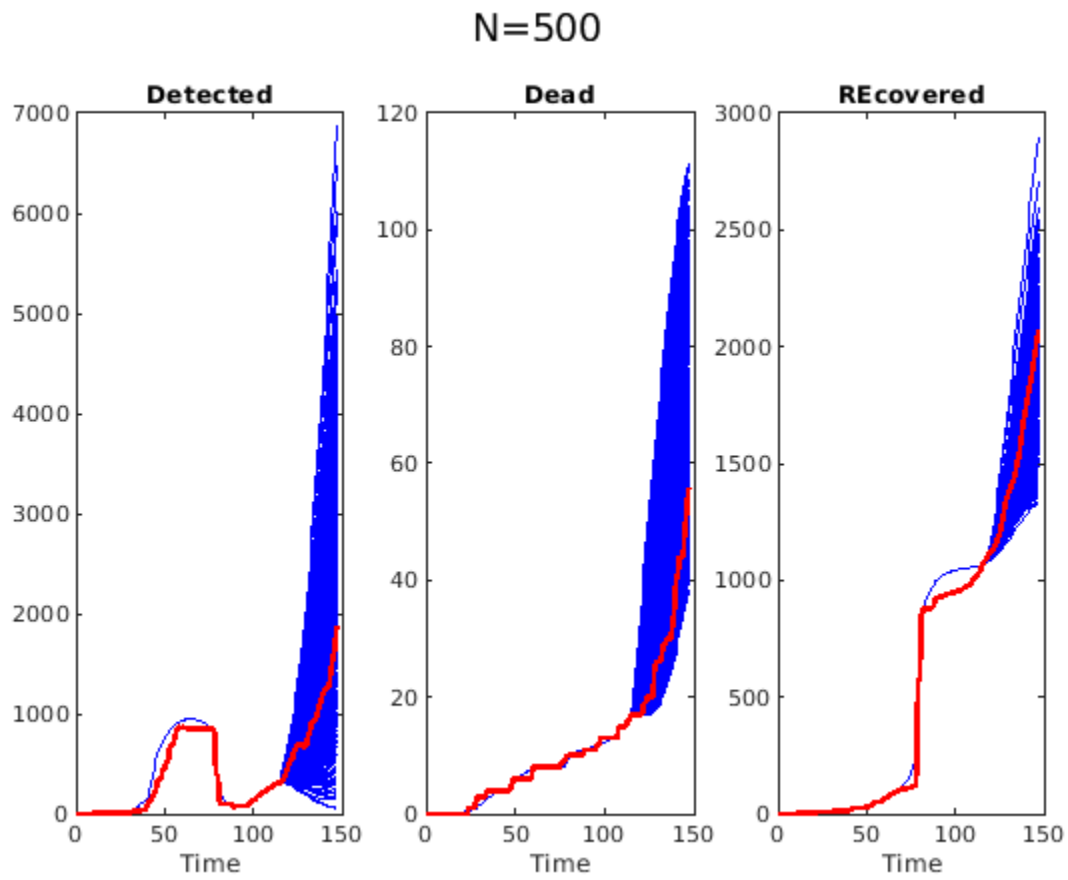
4.3. Identifiability analysys







4.4. Uncertainty analysys



Chapter 5. Extension number5

5.1. Basic information

The extension to be validated consists of the time series from the data148 to the 174. The status of the validation is: COMPLETED.

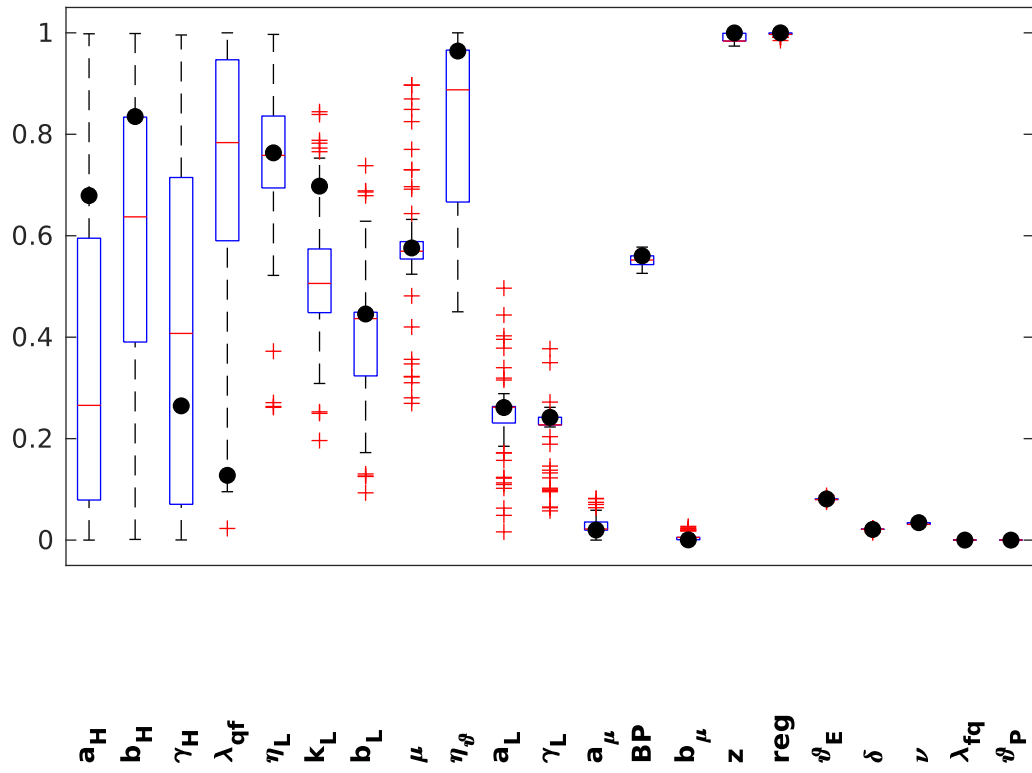
The number of estimations needed to perform the validation was4000.

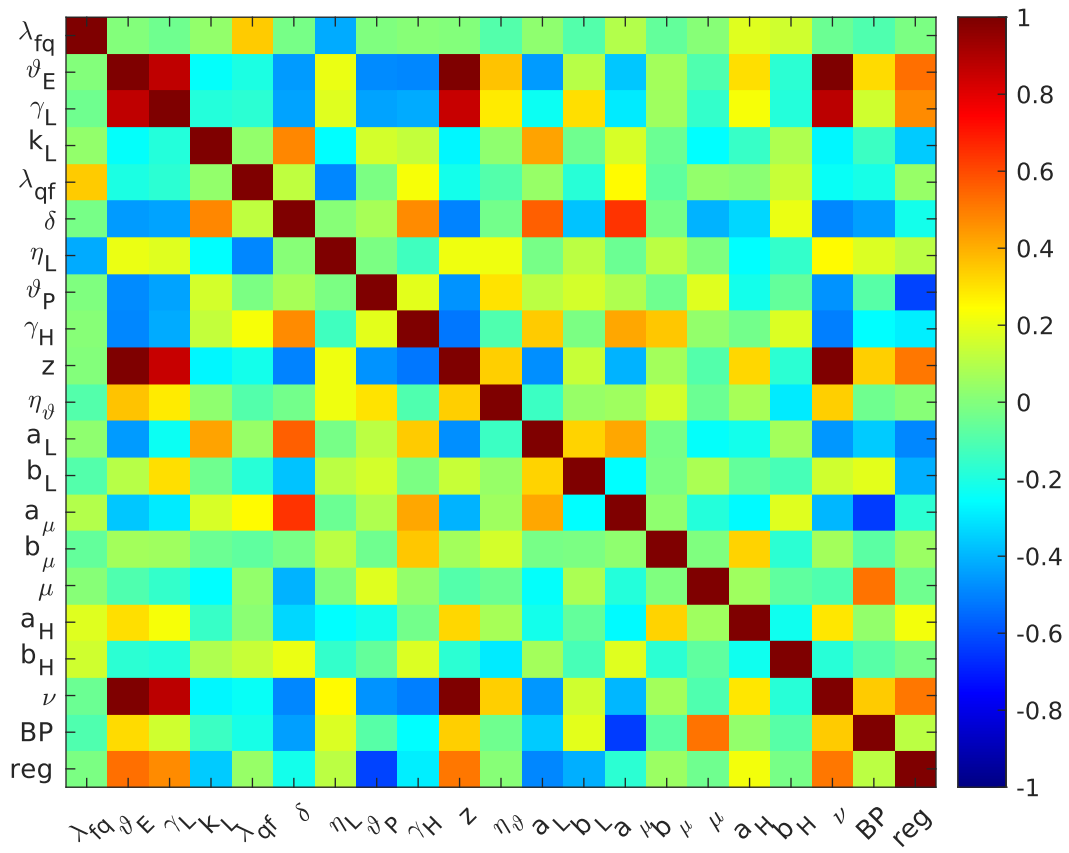
5.2. Estimated parameters with their intervals

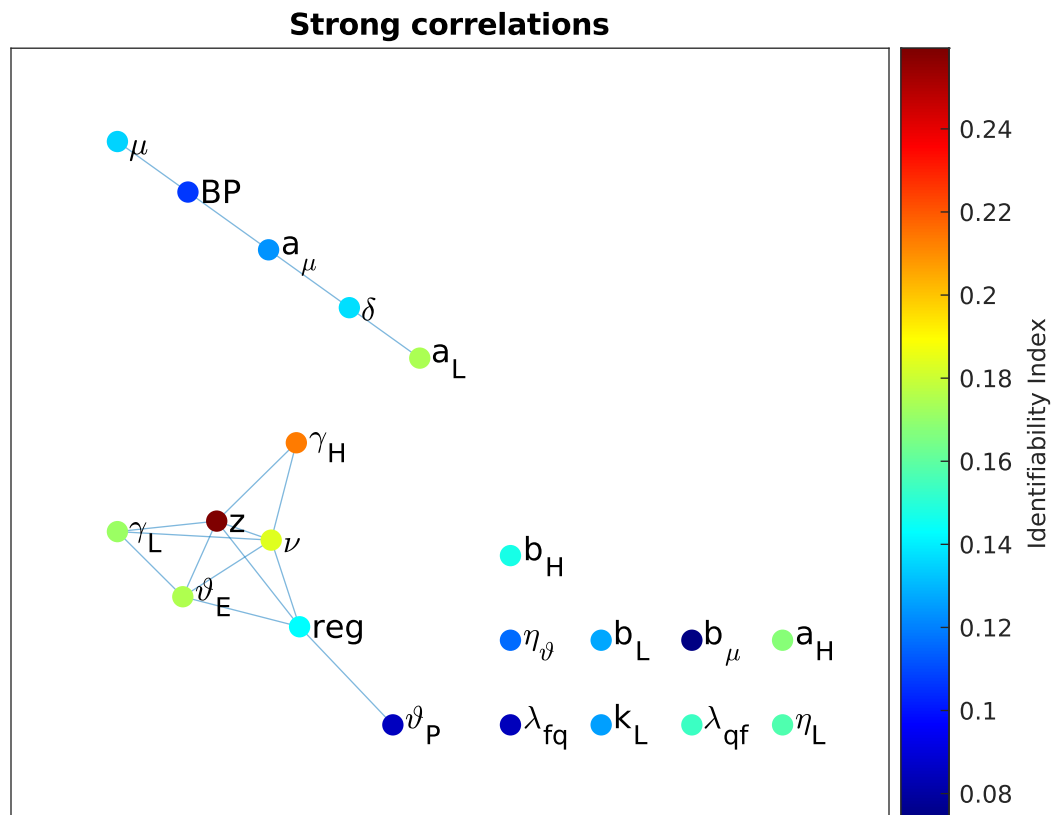
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|------------|----------|
| λ_{fq} | '0' | '0.0795' | '0.0001' | '0' | '0.0843' |
| ϑ_E | '0.0678' | '0.0921' | '0.08' | '0.0811' | '0.1751' |
| γ_L | '0.1966' | '0.2577' | '0.2272' | '0.242' | '0.1713' |
| k_L | '5.039' | '6.0683' | '5.5536' | '7.2796' | '0.1255' |
| λ_{qf} | '0.6908' | '0.8764' | '0.7836' | '0.1277' | '0.1539' |
| δ | '0.001' | '0.0055' | '0.0032' | '0.0031' | '0.1373' |
| η_L | '0.6643' | '0.8524' | '0.7583' | '0.7634' | '0.158' |
| ϑ_P | '0' | '0.0001' | '0' | '0' | '0.0852' |
| γ_H | '0.3023' | '0.5126' | '0.4074' | '0.2646' | '0.2137' |
| z | '25.0693' | '30' | '29.5152' | '29.9932' | '0.2594' |
| η_{ϑ} | '0.8308' | '0.9445' | '0.8877' | '0.9641' | '0.1166' |
| a_L | '3.6336' | '5.7016' | '4.6676' | '4.6587' | '0.1742' |
| b_L | '6.184' | '8.0426' | '7.1133' | '7.2401' | '0.1276' |
| a_{μ} | '1.1332' | '1.48' | '1.3066' | '1.2785' | '0.1239' |
| b_{μ} | '1' | '1.8064' | '1.075' | '1.0056' | '0.0741' |
| μ | '0.5014' | '0.6376' | '0.5695' | '0.5759' | '0.135' |
| a_H | '3.3429' | '6.0937' | '4.7183' | '10.5091' | '0.1675' |
| b_H | '8.67' | '11.1721' | '9.9211' | '12.6891' | '0.1475' |
| ν | '12.9531' | '18.0528' | '15.5029' | '17.1783' | '0.1835' |
| BP | '147.7393' | '148.3029' | '148.0211' | '148.4986' | '0.107' |
| reg | '0.245' | '0.25' | '0.2492' | '0.25' | '0.1435' |

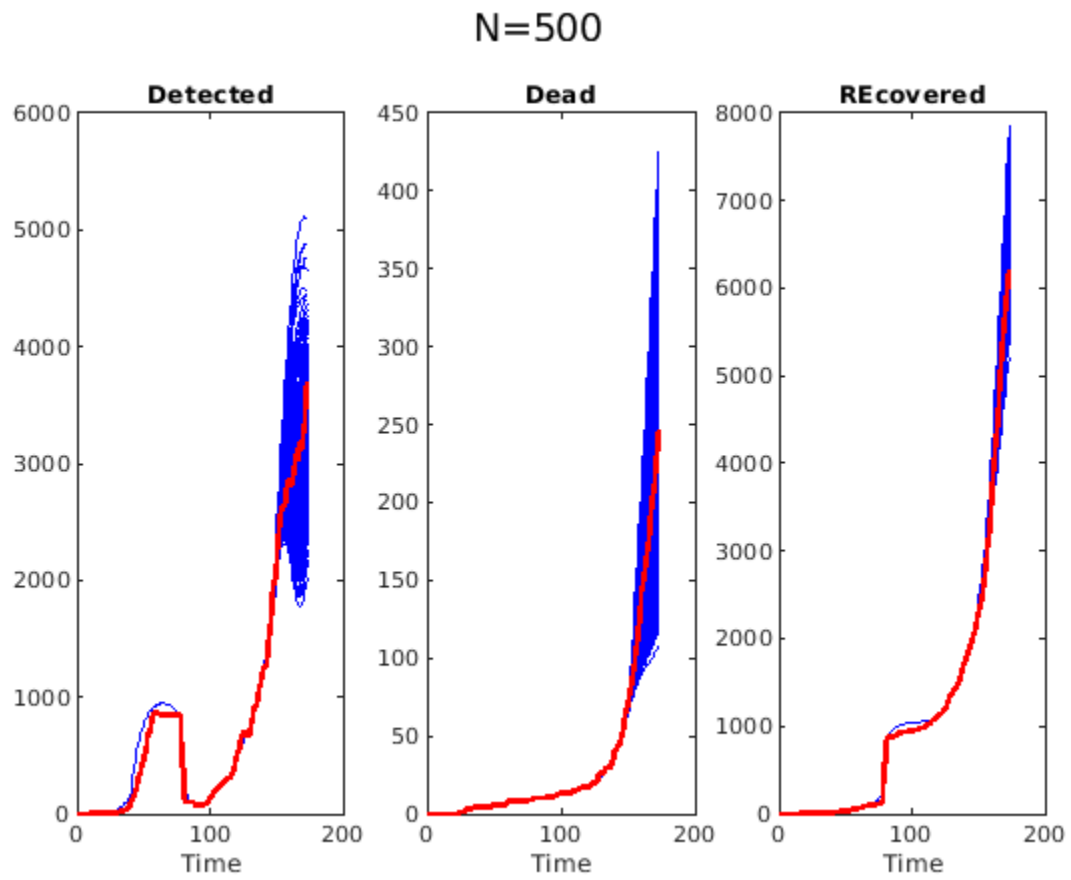
5.3. Identifiability analysis







5.4. Uncertainty analysys



Chapter 6. Extension number6

6.1. Basic information

The extension to be validated consists of the time series from the data174 to the 201. The status of the validation is: COMPLETED.

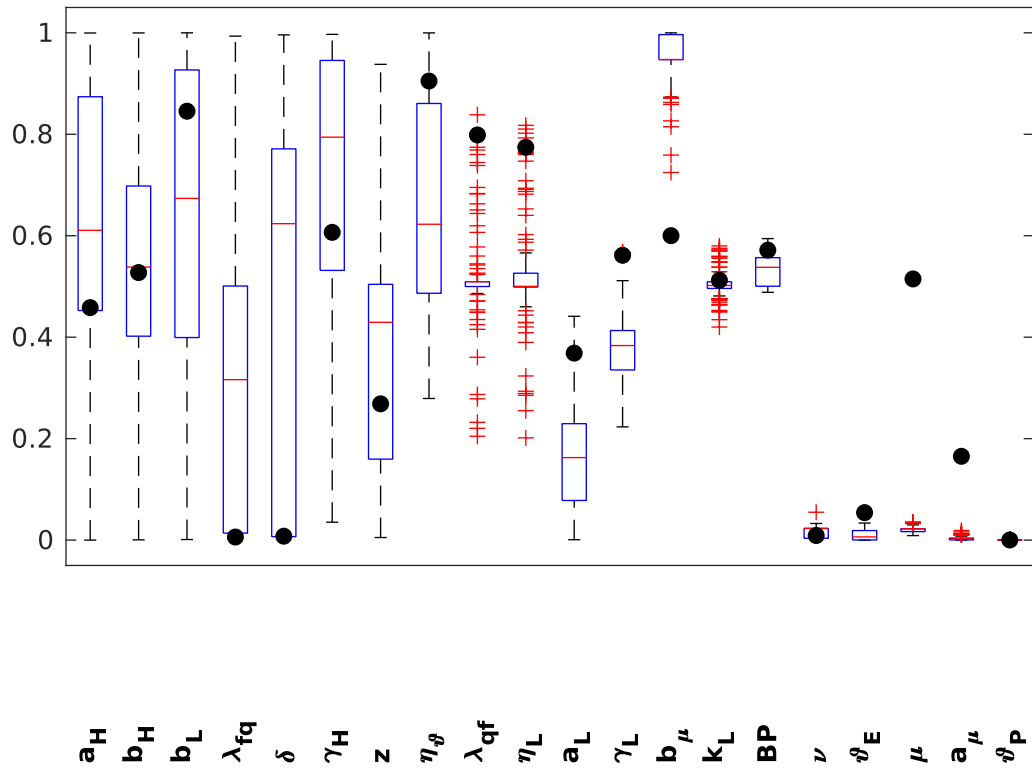
The number of estimations needed to perform the validation was2000.

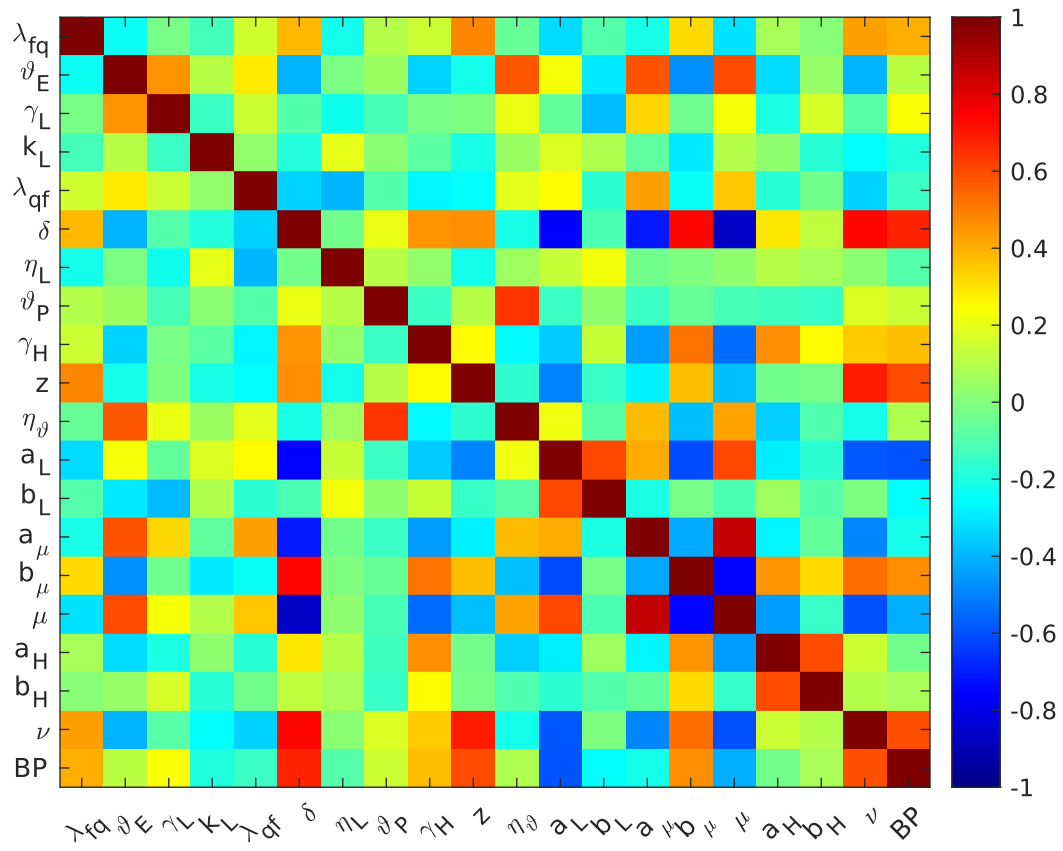
6.2. Estimated parameters with their intervals

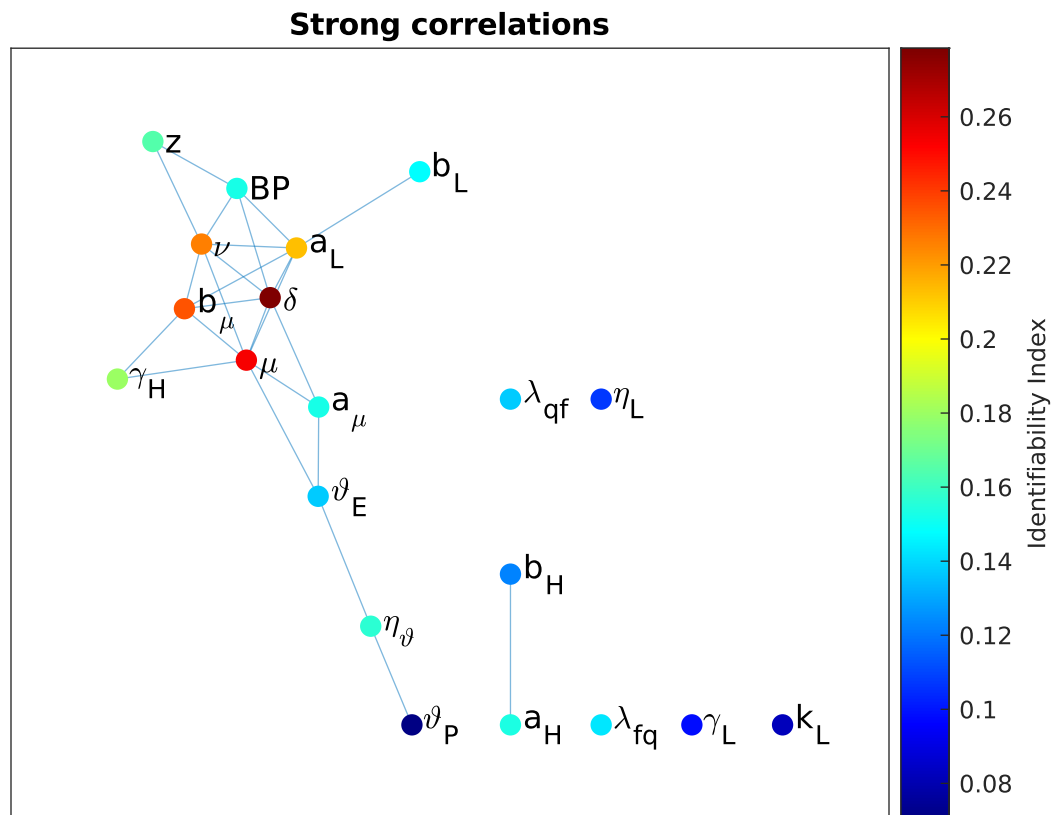
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|-----------|------------|----------|
| λ_{fq} | '0.2491' | '0.3835' | '0.3163' | '0.006' | '0.1429' |
| ϑ_E | '0.0025' | '0.0101' | '0.0063' | '0.0541' | '0.1379' |
| γ_L | '0.3493' | '0.4177' | '0.3835' | '0.5615' | '0.0985' |
| k_L | '5.2812' | '5.7533' | '5.5172' | '5.6092' | '0.0822' |
| λ_{qf} | '0.4504' | '0.5684' | '0.5094' | '0.7986' | '0.1374' |
| δ | '0.0813' | '0.1058' | '0.0936' | '0.0012' | '0.2785' |
| η_L | '0.4453' | '0.5552' | '0.5002' | '0.7743' | '0.1075' |
| ϑ_P | '0' | '0.0005' | '0.0002' | '0.0002' | '0.0706' |
| γ_H | '0.7326' | '0.856' | '0.7943' | '0.6067' | '0.1796' |
| z | '11.446' | '14.3165' | '12.8812' | '8.0599' | '0.1649' |
| η_{ϑ} | '0.5738' | '0.6715' | '0.6226' | '0.9049' | '0.157' |
| a_L | '2.9098' | '3.6436' | '3.2767' | '6.1599' | '0.2135' |
| b_L | '9.412' | '11.4489' | '10.4304' | '12.8367' | '0.1486' |
| a_{μ} | '1' | '1.2563' | '1.0517' | '3.3129' | '0.1532' |
| b_{μ} | '13.2923' | '15' | '14.2609' | '9.4025' | '0.2354' |
| μ | '0' | '0.0865' | '0.0222' | '0.5148' | '0.2539' |
| a_H | '8.6994' | '10.4005' | '9.55' | '7.4154' | '0.154' |
| b_H | '7.8139' | '9.2551' | '8.5345' | '8.3833' | '0.1227' |
| ν | '0' | '42.0623' | '11.5239' | '4.5228' | '0.2261' |
| BP | '176.1281' | '176.8719' | '176.5' | '178.2961' | '0.153' |

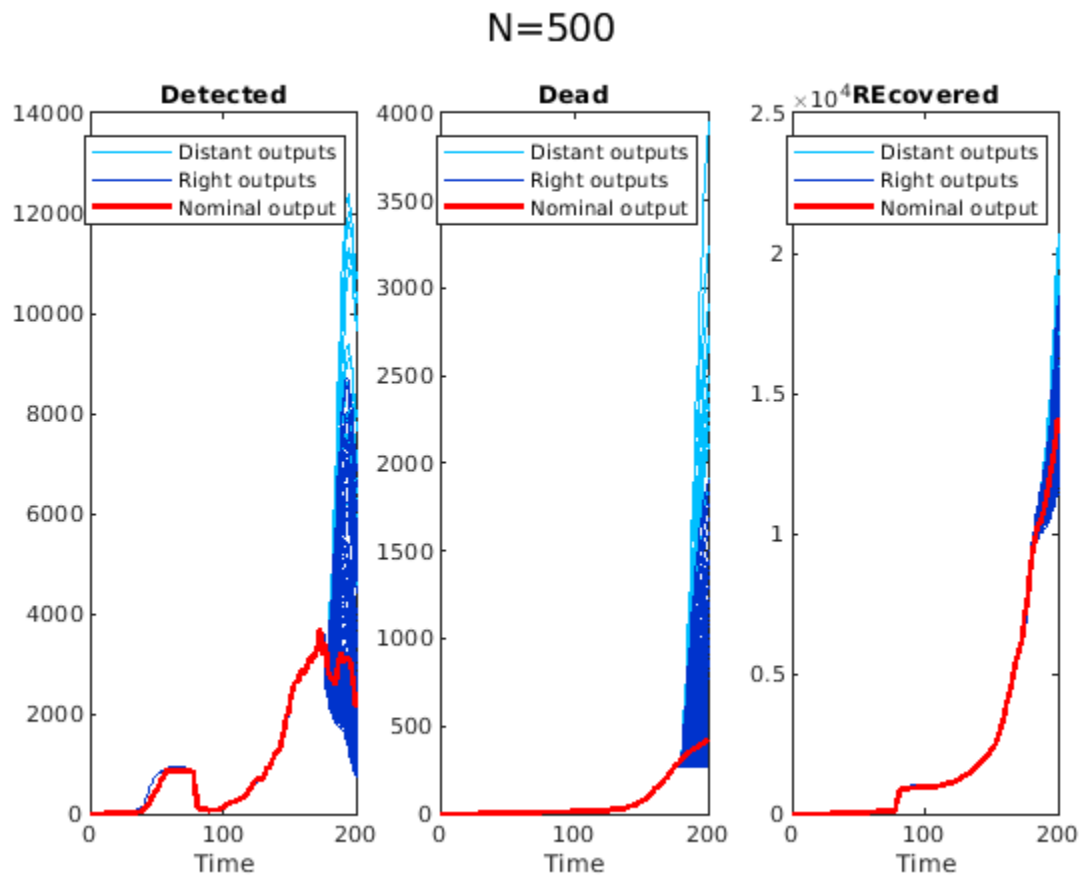
6.3. Identifiability analysys







6.4. Uncertainty analysys



Chapter 7. Extension number7

7.1. Basic information

The extension to be validated consists of the time series from the data201 to the 236. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

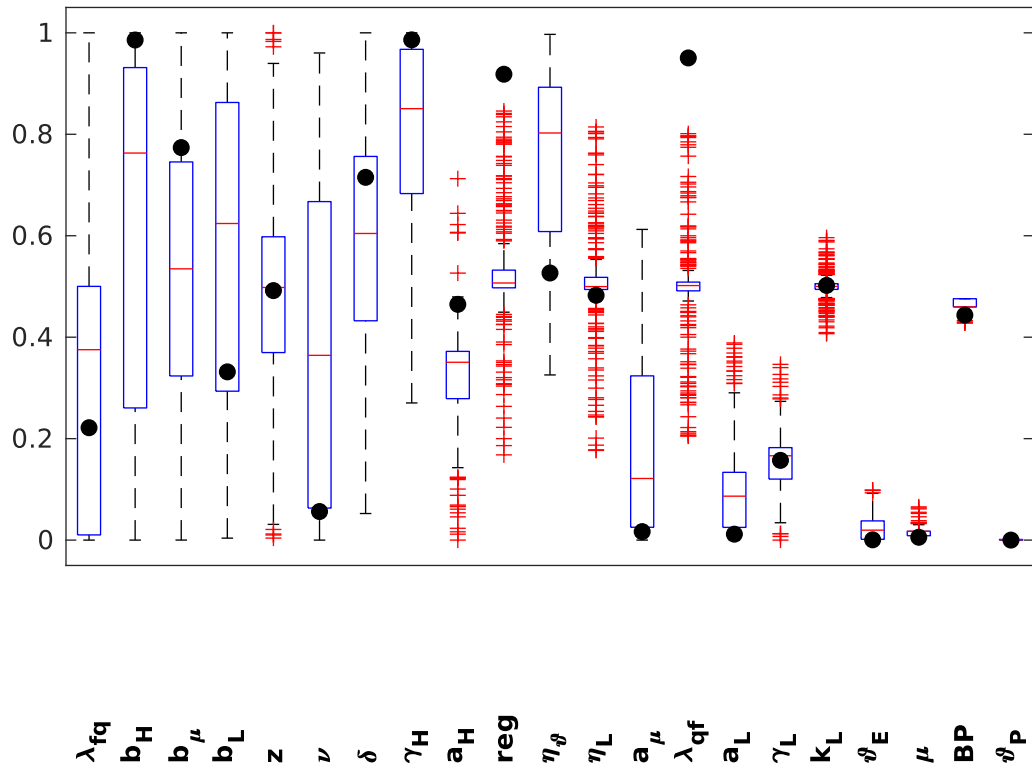
7.2. Estimated parameters with their intervals

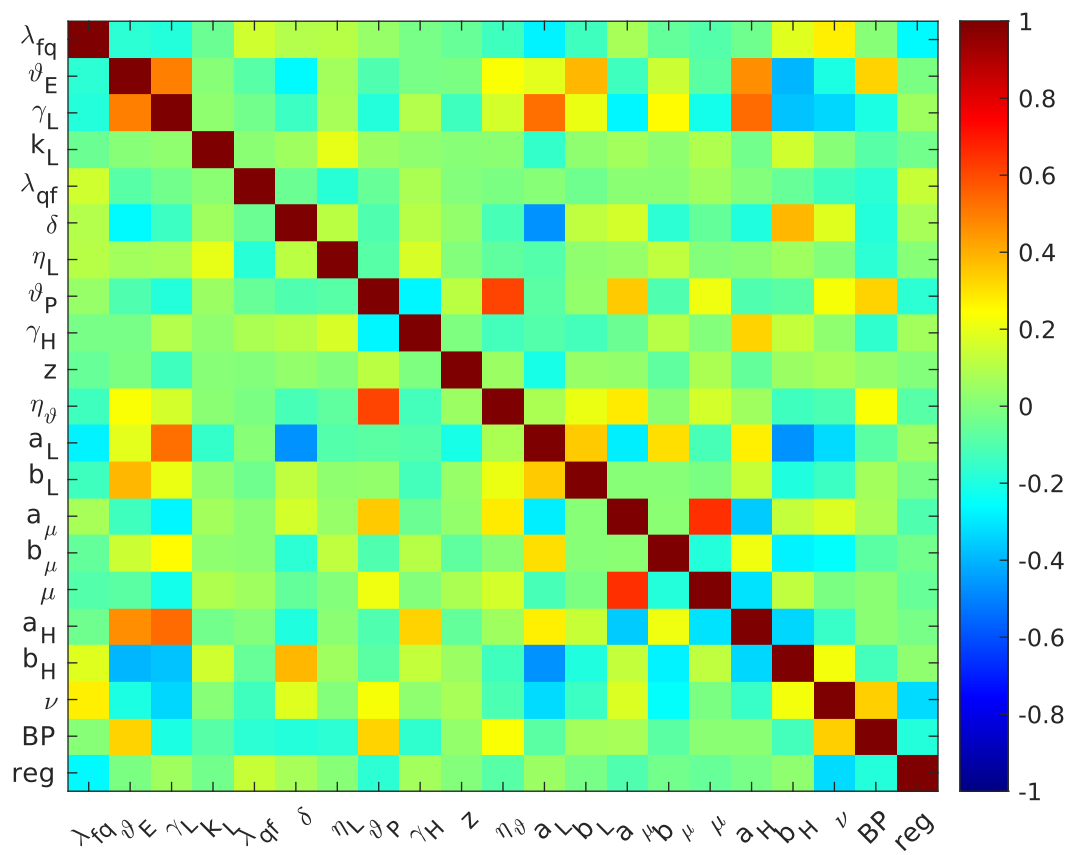
It was necessary to fix 0 parameters of 11 that could be fixed to complete validation.

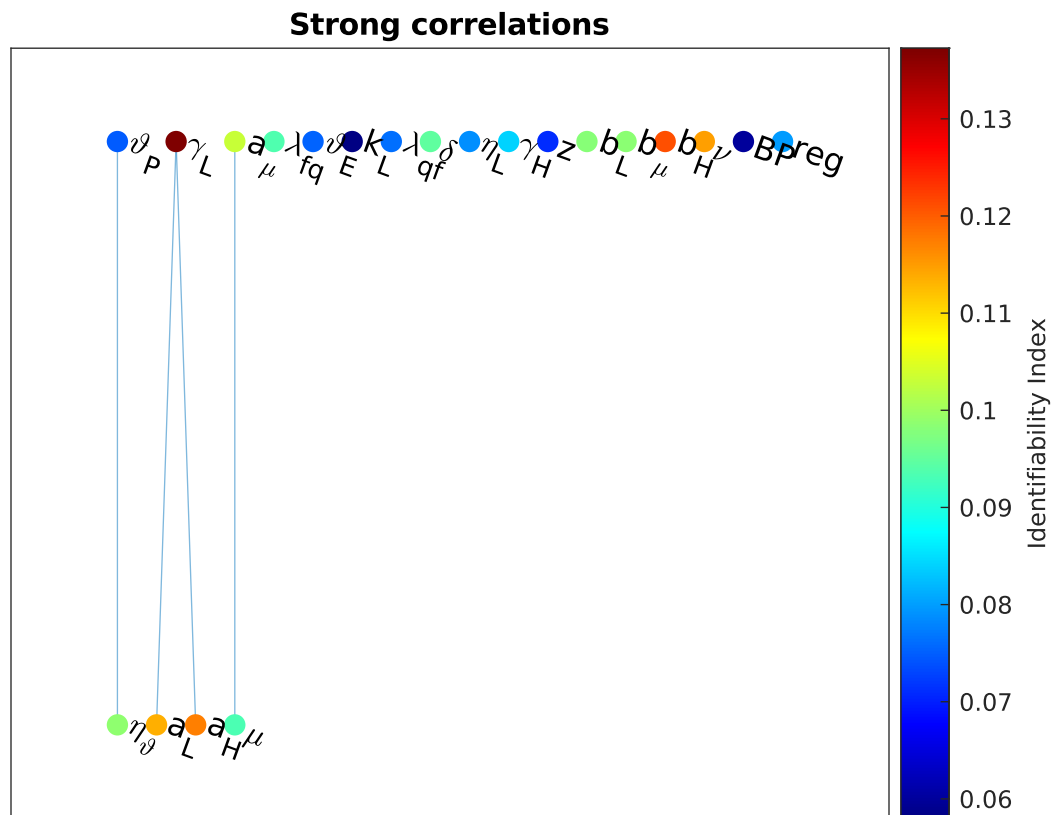
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|-----------|----------|
| λ_{fq} | '0.0033' | '1' | '0.3754' | '0.2216' | '0.0937' |
| ϑ_E | '0' | '0.0013' | '0.0196' | '0.0006' | '0.0756' |
| γ_L | '0.1184' | '0.1617' | '0.1663' | '0.1572' | '0.1373' |
| k_L | '1' | '10' | '5.5007' | '5.5187' | '0.058' |
| λ_{qf} | '0' | '1' | '0.5018' | '0.9505' | '0.0765' |
| δ | '0.089' | '0.15' | '0.0907' | '0.1073' | '0.0949' |
| η_L | '0' | '1' | '0.4998' | '0.4826' | '0.0789' |
| ϑ_P | '0' | '0' | '0.0005' | '0' | '0.075' |
| γ_H | '0.3165' | '1' | '0.8505' | '0.9862' | '0.0842' |
| z | '0' | '28.5' | '14.9407' | '14.7552' | '0.0713' |
| η_{ϑ} | '0.4631' | '0.5367' | '0.8026' | '0.5265' | '0.0988' |
| a_L | '1.1396' | '1.8784' | '2.2126' | '1.1637' | '0.1135' |
| b_L | '5.6251' | '9.8988' | '9.7376' | '5.6434' | '0.0983' |
| a_{μ} | '1' | '15' | '2.7007' | '1.234' | '0.1031' |
| b_{μ} | '1' | '15' | '8.4867' | '11.8327' | '0.0984' |
| μ | '0.0005' | '0.0126' | '0.0174' | '0.0056' | '0.0935' |
| a_H | '7.4492' | '11.853' | '5.9083' | '7.5066' | '0.1173' |
| b_H | '7.1135' | '15' | '11.682' | '14.8019' | '0.121' |
| ν | '27.0846' | '408.2889' | '182.1029' | '28.1608' | '0.1149' |
| BP | '201.0296' | '204.847' | '202.5' | '201.5' | '0.0599' |
| reg | '0' | '0.25' | '0.1267' | '0.2296' | '0.0799' |

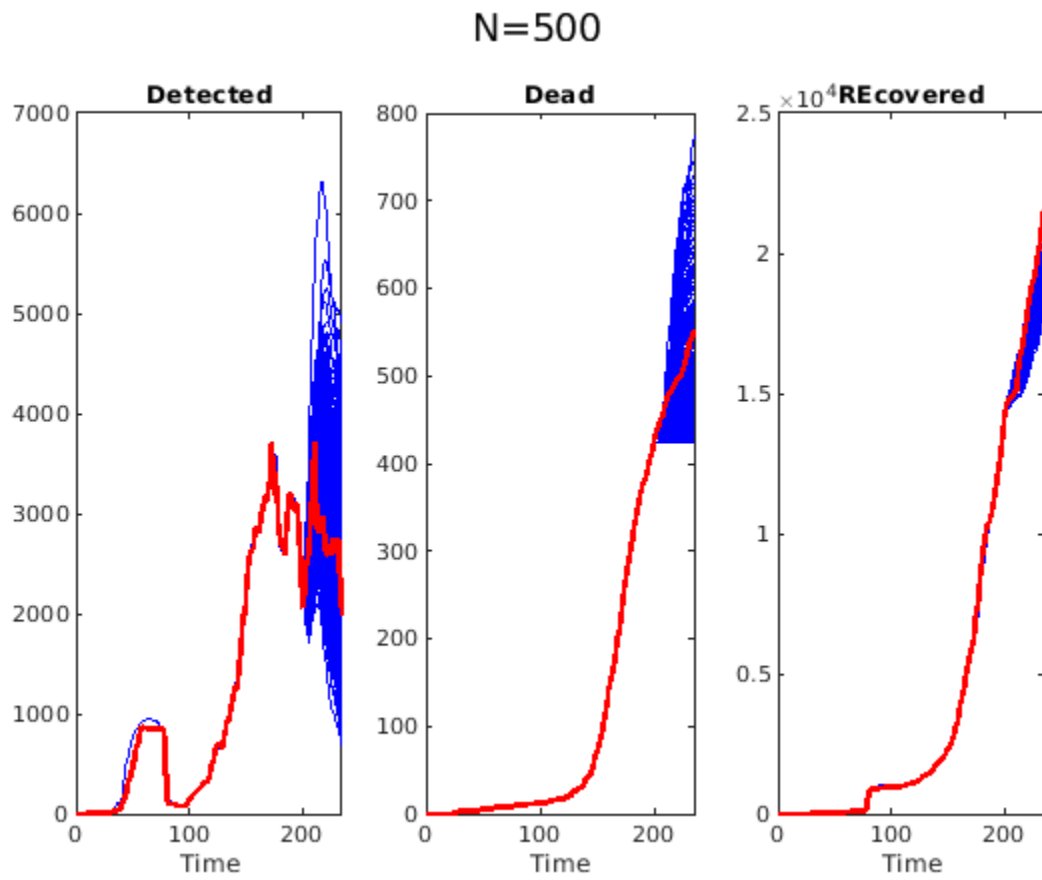
7.3. Identifiability analysys







7.4. Uncertainty analysis



Chapter 8. Extension number8

8.1. Basic information

The extension to be validated consists of the time series from the data236 to the 320. The status of the validation is: COMPLETED.

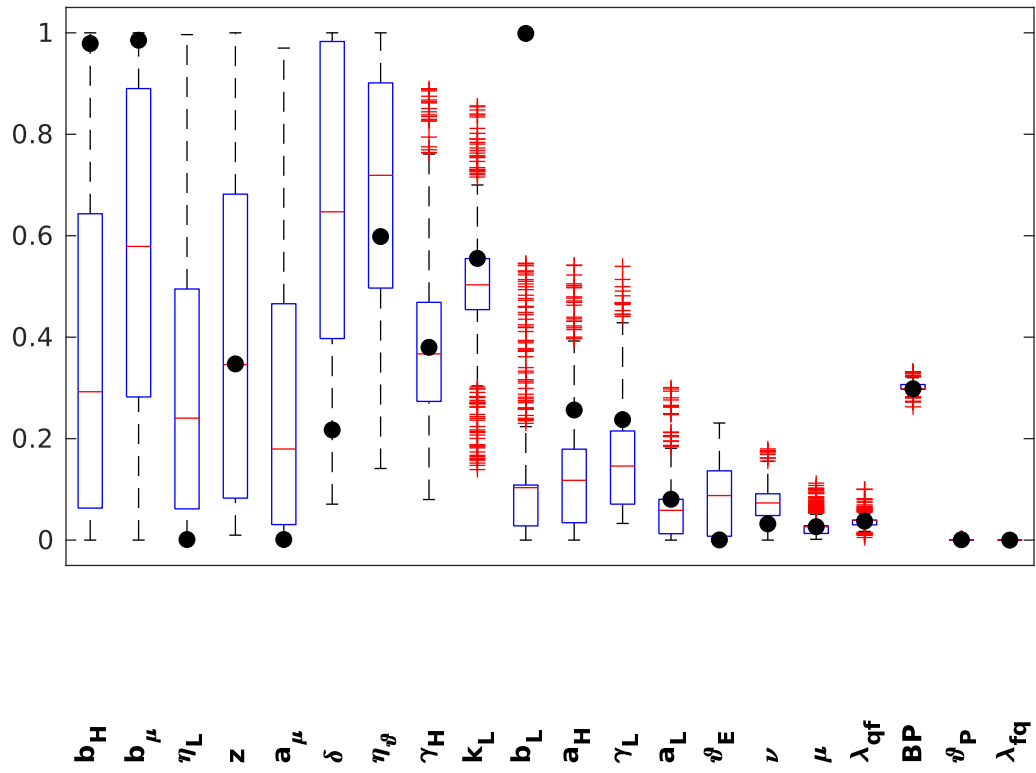
The number of estimations needed to perform the validation was1000.

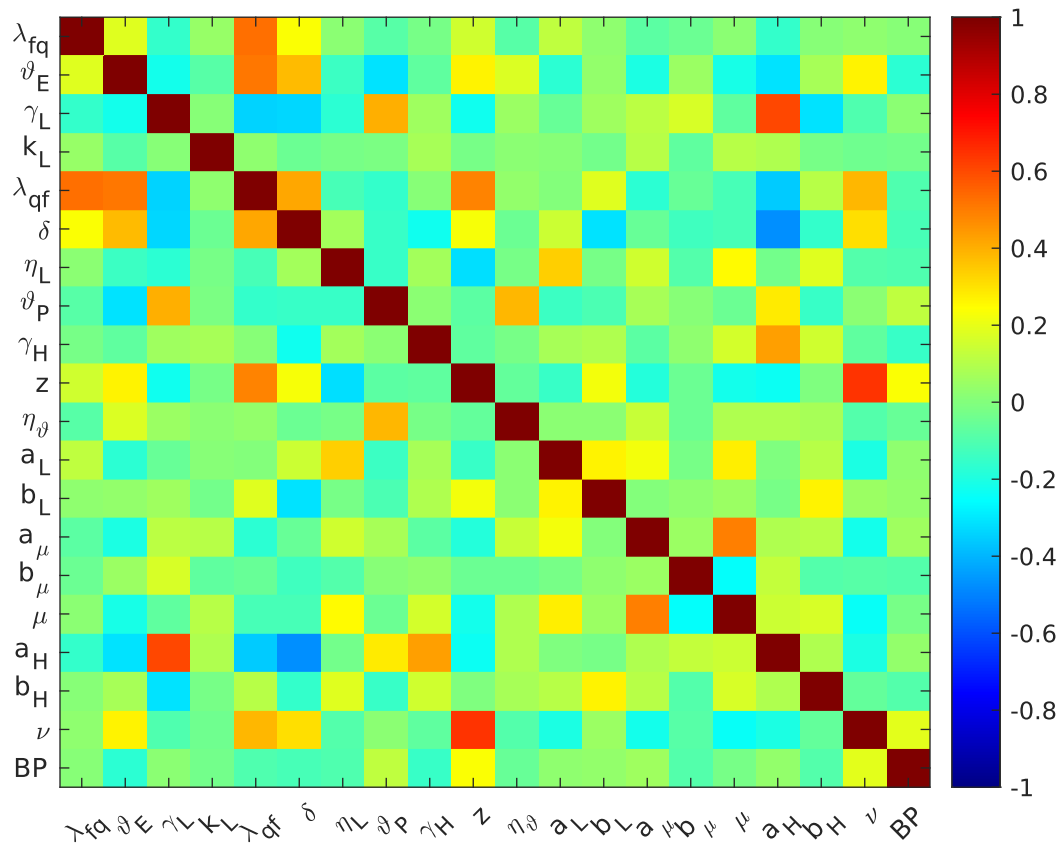
8.2. Estimated parameters with their intervals

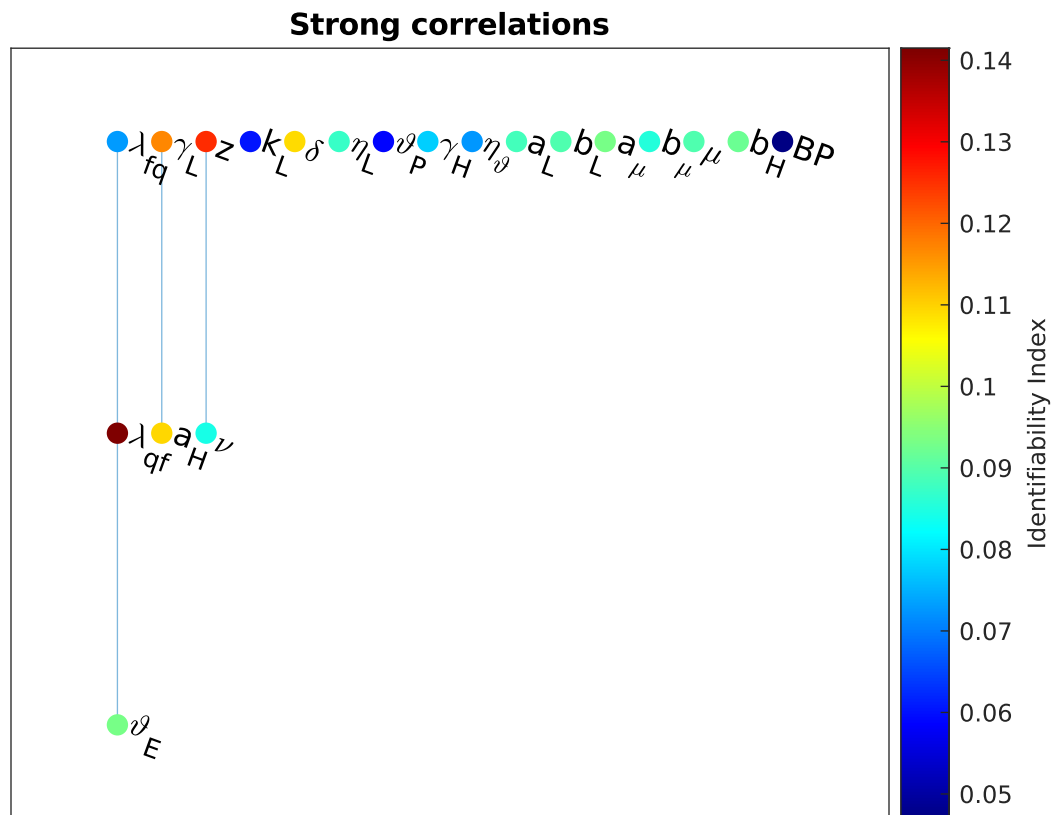
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|-----------|------------|----------|
| λ_{fq} | '0' | '0.0211' | '0' | '0' | '0.073' |
| ϑ_E | '0.0796' | '0.0959' | '0.0878' | '0.0004' | '0.0933' |
| γ_L | '0.1098' | '0.1826' | '0.1462' | '0.2375' | '0.1168' |
| k_L | '5.3028' | '5.7551' | '5.5289' | '5.9979' | '0.0604' |
| λ_{qf} | '0' | '0.0805' | '0.0393' | '0.0374' | '0.1415' |
| δ | '0.0918' | '0.1024' | '0.0971' | '0.0326' | '0.1091' |
| η_L | '0.2073' | '0.2737' | '0.2405' | '0.0011' | '0.0873' |
| ϑ_P | '0' | '0.0013' | '0.0005' | '0.0008' | '0.059' |
| γ_H | '0.3373' | '0.397' | '0.3672' | '0.38' | '0.078' |
| z | '9.1818' | '11.5818' | '10.3818' | '10.4213' | '0.1253' |
| η_{ϑ} | '0.69' | '0.7482' | '0.7191' | '0.5984' | '0.0728' |
| a_L | '1.3469' | '2.2984' | '1.8227' | '2.1261' | '0.0884' |
| b_L | '1.8603' | '3.0377' | '2.449' | '14.9834' | '0.0898' |
| a_{μ} | '3.0156' | '4.0358' | '3.5257' | '1.0173' | '0.0935' |
| b_{μ} | '8.5155' | '9.6964' | '9.106' | '14.7951' | '0.0855' |
| μ | '0' | '0.0536' | '0.0262' | '0.0264' | '0.0895' |
| a_H | '2.2995' | '3.001' | '2.6502' | '4.5909' | '0.1096' |
| b_H | '4.5363' | '5.6518' | '5.094' | '14.7053' | '0.0923' |
| ν | '33.7795' | '39.5718' | '36.6757' | '16.0426' | '0.0843' |
| BP | '236.3212' | '236.6788' | '236.5' | '236.4989' | '0.047' |

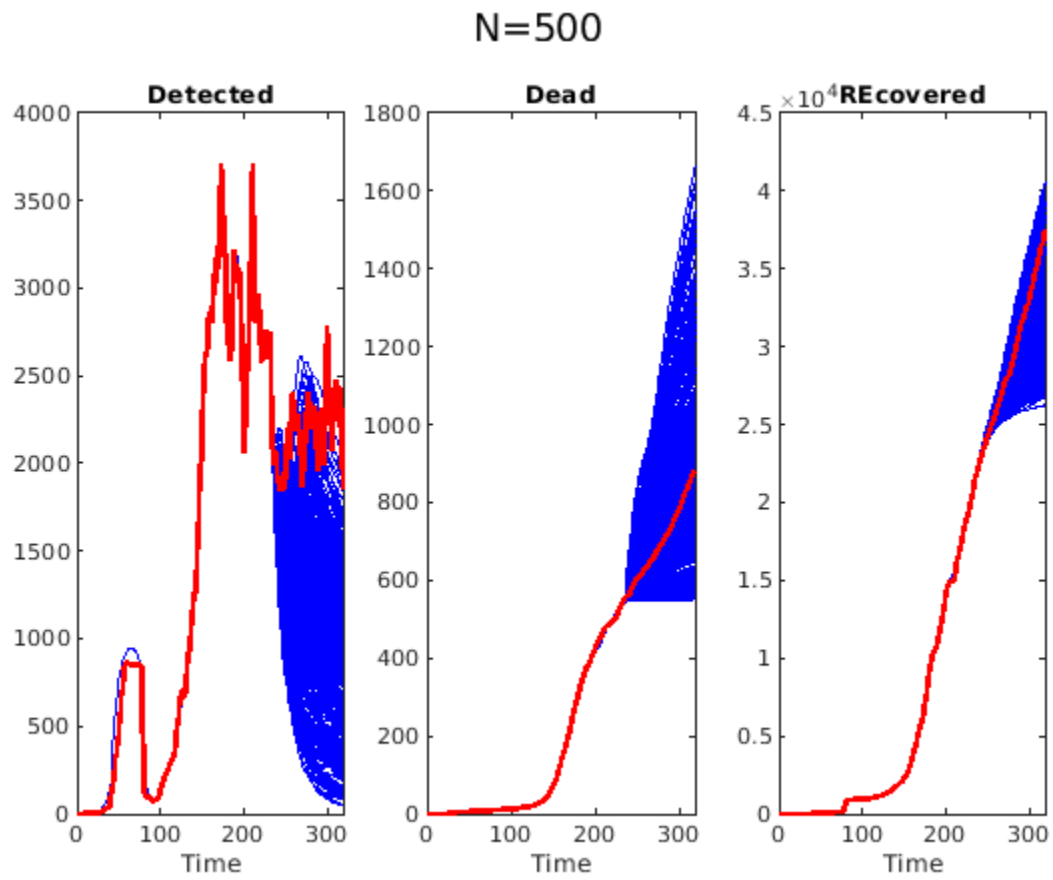
8.3. Identifiability analysis







8.4. Uncertainty analysis



Chapter 9. Extension number9

9.1. Basic information

The extension to be validated consists of the time series from the data320 to the 339. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

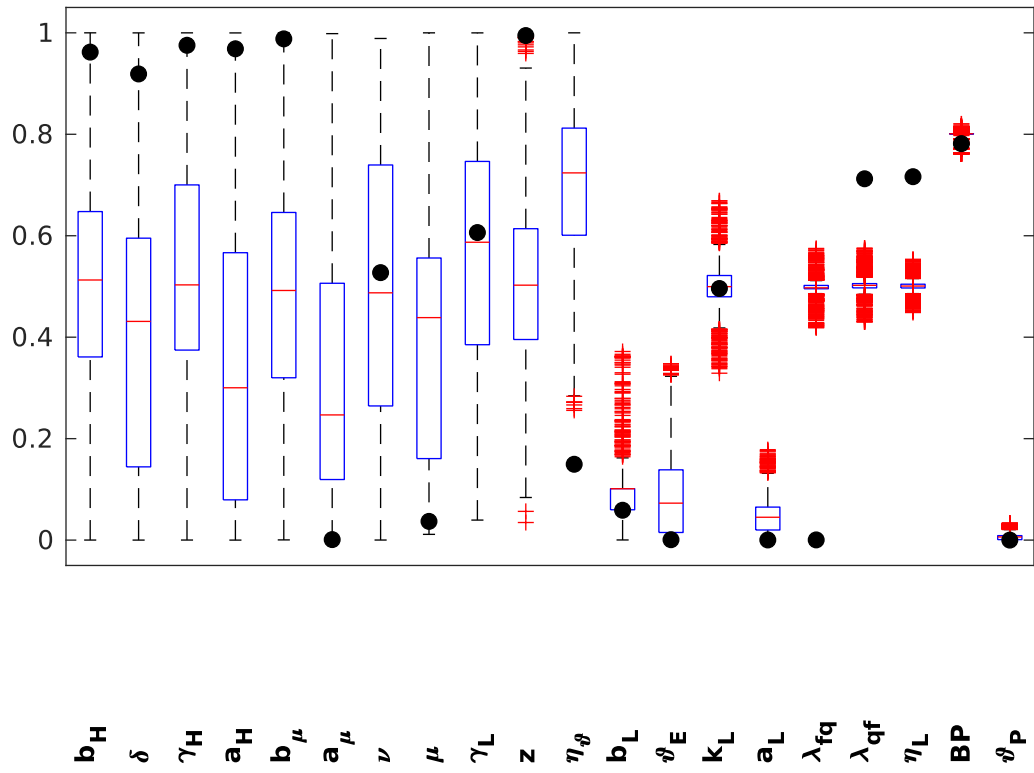
9.2. Estimated parameters with their intervals

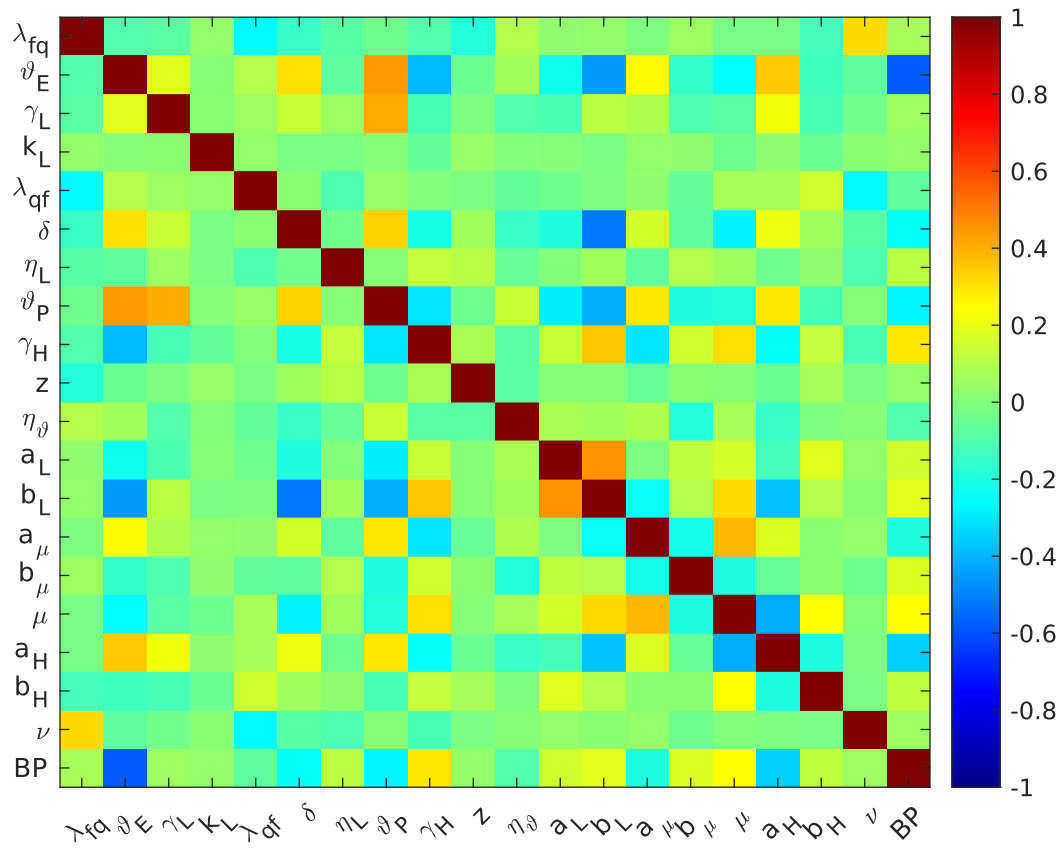
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

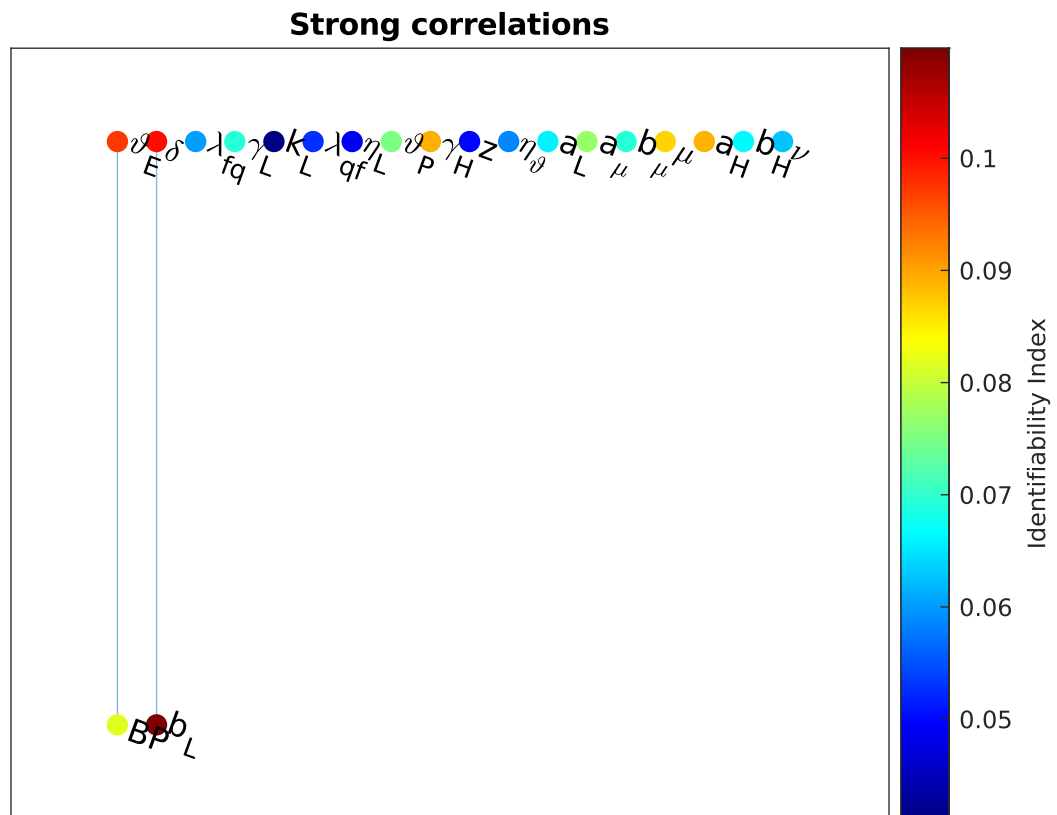
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|------------|----------|
| λ_{fq} | '0' | '0.0009' | '0.4973' | '0.0004' | '0.0603' |
| ϑ_E | '0' | '0.0018' | '0.0728' | '0.0008' | '0.0974' |
| γ_L | '0.4372' | '0.7873' | '0.5872' | '0.6063' | '0.0695' |
| k_L | '1' | '10' | '5.4969' | '5.4637' | '0.0412' |
| λ_{qf} | '0' | '1' | '0.5022' | '0.7123' | '0.0527' |
| δ | '0.0609' | '0.1389' | '0.0647' | '0.1378' | '0.1003' |
| η_L | '0' | '1' | '0.5008' | '0.7164' | '0.0488' |
| ϑ_P | '0' | '0' | '0.0062' | '0' | '0.075' |
| γ_H | '0.02' | '1' | '0.5031' | '0.9754' | '0.0893' |
| z | '0' | '30' | '15.0795' | '29.8379' | '0.0499' |
| η_{ϑ} | '0.1475' | '0.2562' | '0.7238' | '0.1495' | '0.0587' |
| a_L | '1' | '1.7991' | '1.6307' | '1.0039' | '0.066' |
| b_L | '1.7352' | '2.4143' | '2.4192' | '1.824' | '0.1098' |
| a_{μ} | '1' | '15' | '4.4548' | '1.0138' | '0.077' |
| b_{μ} | '1.35' | '15' | '7.8892' | '14.8332' | '0.0696' |
| μ | '0' | '0.0831' | '0.4386' | '0.0369' | '0.0868' |
| a_H | '6.0909' | '15' | '5.204' | '14.559' | '0.0889' |
| b_H | '2.4' | '15' | '8.1785' | '14.4681' | '0.0666' |
| ν | '133.637' | '500' | '243.7339' | '263.6315' | '0.0627' |
| BP | '316.1314' | '321.6032' | '318.5' | '316.5' | '0.0817' |

9.3. Identifiability analysis

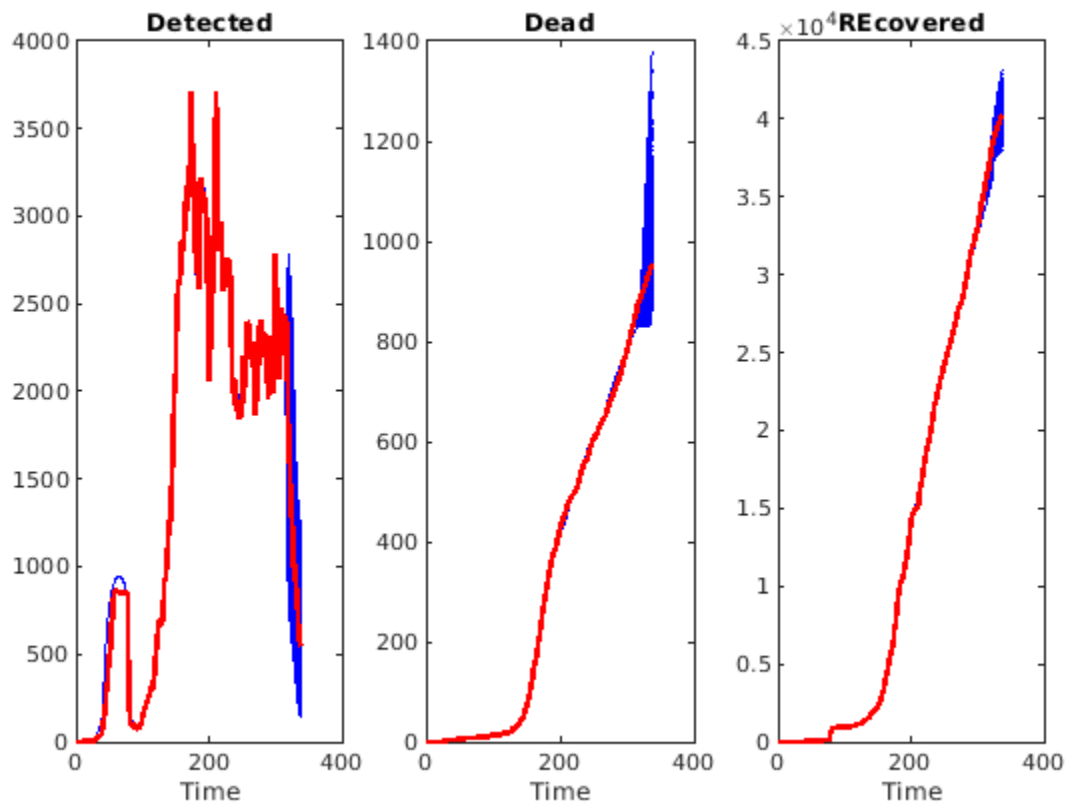






9.4. Uncertainty analysis

N=500



Chapter 10. Extension number10

10.1. Basic information

The extension to be validated consists of the time series from the data339 to the 386. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

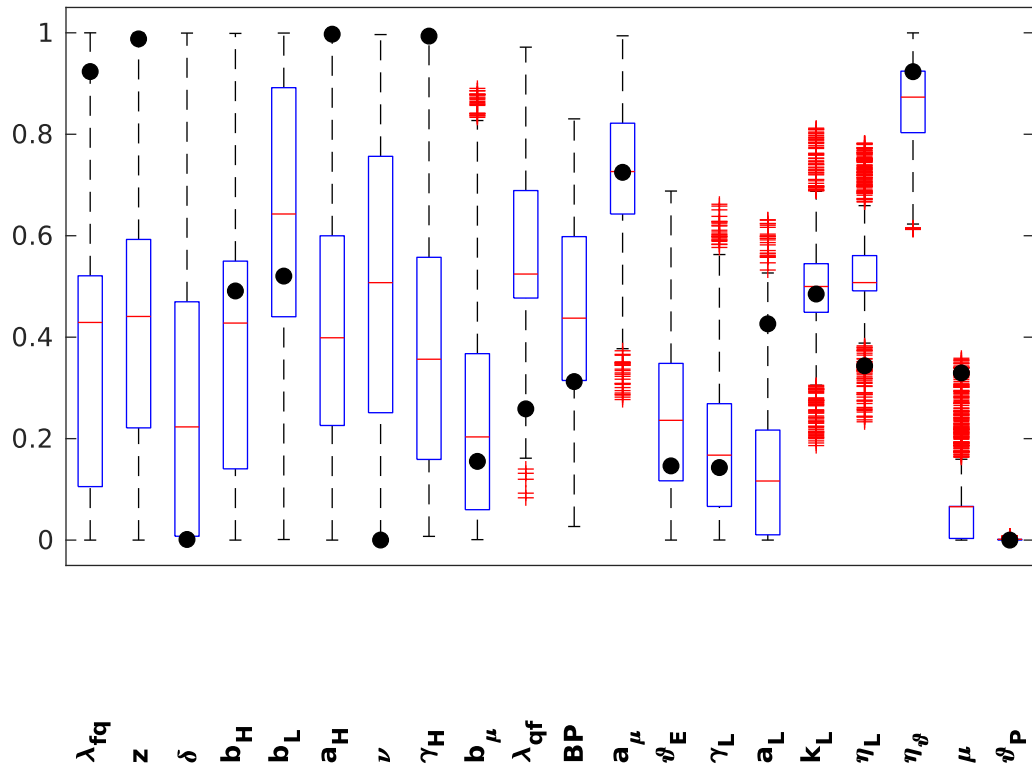
10.2. Estimated parameters with their intervals

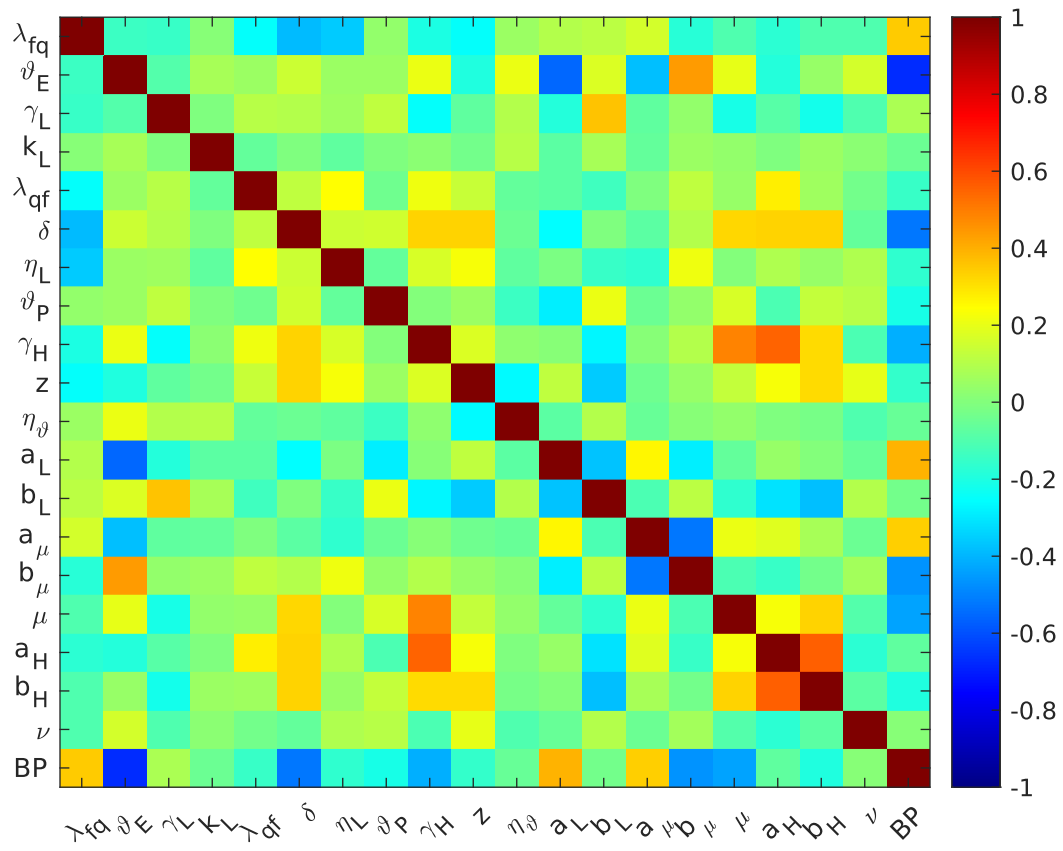
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

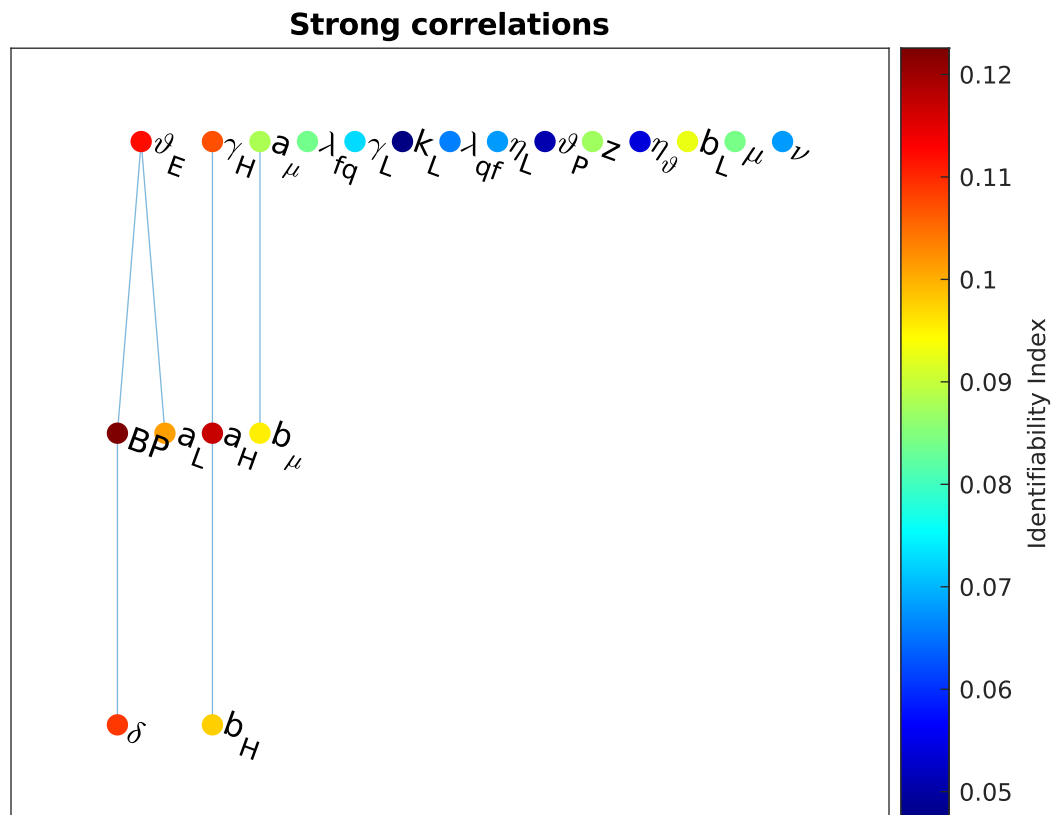
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|------------|----------|
| λ_{fq} | '0.7323' | '0.9491' | '0.429' | '0.9236' | '0.0838' |
| ϑ_E | '0.1323' | '0.1782' | '0.2361' | '0.1463' | '0.1122' |
| γ_L | '0.1089' | '0.4694' | '0.1676' | '0.143' | '0.0727' |
| k_L | '1' | '9.325' | '5.4992' | '5.3655' | '0.0474' |
| λ_{qf} | '0.1887' | '0.2757' | '0.5245' | '0.2587' | '0.0661' |
| δ | '0' | '0.0004' | '0.0335' | '0.0002' | '0.1088' |
| η_L | '0.021' | '0.3536' | '0.5076' | '0.3436' | '0.0682' |
| ϑ_P | '0' | '0' | '0.0015' | '0' | '0.0507' |
| γ_H | '0.3512' | '1' | '0.3565' | '0.9935' | '0.1072' |
| z | '22.0411' | '30' | '13.2251' | '29.6384' | '0.0871' |
| η_{ϑ} | '0.5051' | '1' | '0.8731' | '0.9234' | '0.0541' |
| a_L | '6.962' | '11.0599' | '2.632' | '6.9684' | '0.1014' |
| b_L | '4.1238' | '8.5188' | '9.9997' | '8.2862' | '0.0927' |
| a_{μ} | '7.9961' | '15' | '11.17' | '11.1493' | '0.0881' |
| b_{μ} | '1.644' | '8.6468' | '3.8531' | '3.1724' | '0.0953' |
| μ | '0.0145' | '0.5556' | '0.0659' | '0.3295' | '0.0842' |
| a_H | '8.8638' | '15' | '6.5837' | '14.9617' | '0.1173' |
| b_H | '4.4814' | '13.4613' | '6.9896' | '7.8754' | '0.0977' |
| ν | '0' | '0.1253' | '253.7433' | '0.0619' | '0.0683' |
| BP | '337.0747' | '341.4018' | '344.5' | '337.4982' | '0.1226' |

10.3. Identifiability analysis

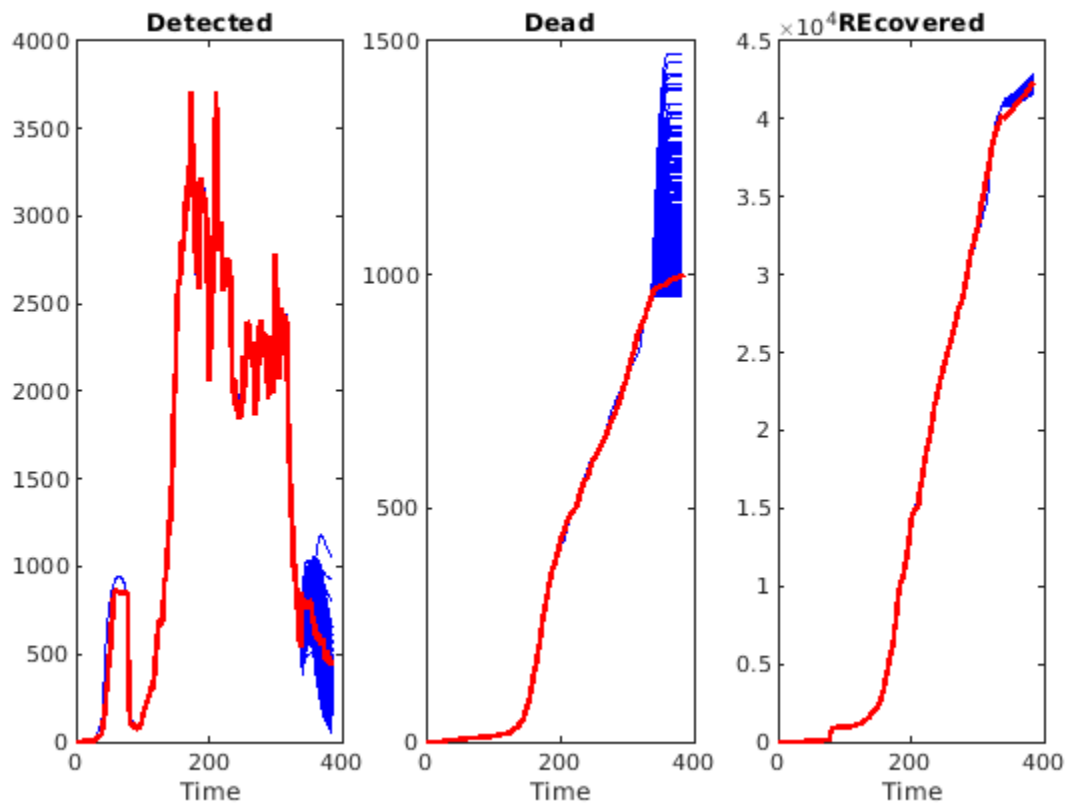






10.4. Uncertainty analysis

N=500



Chapter 11. Extension number11

11.1. Basic information

The extension to be validated consists of the time series from the data386 to the 437. The status of the validation is: COMPLETED.

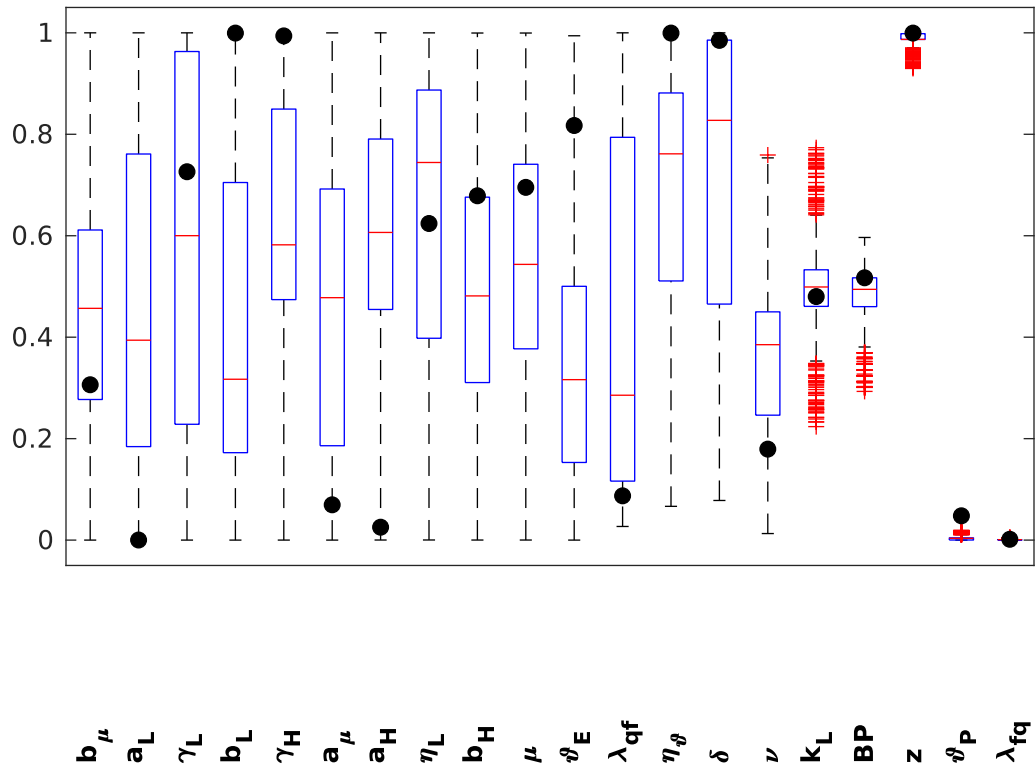
The number of estimations needed to perform the validation was1000.

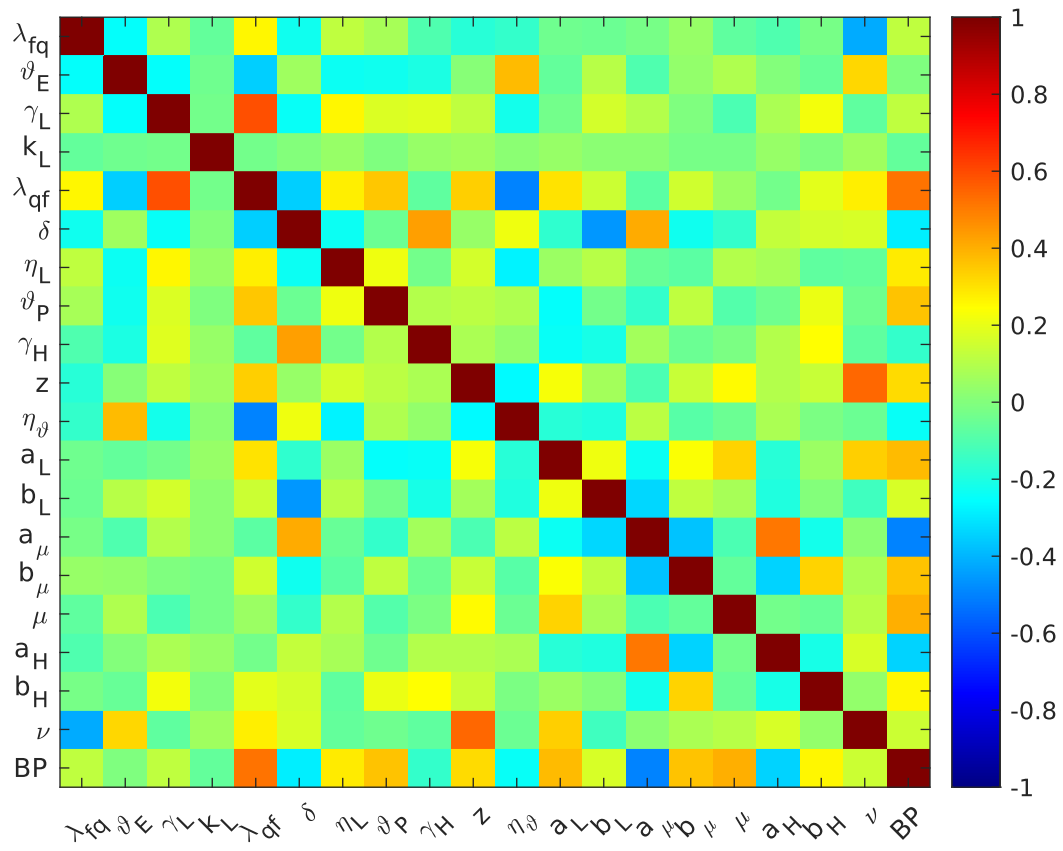
11.2. Estimated parameters with their intervals

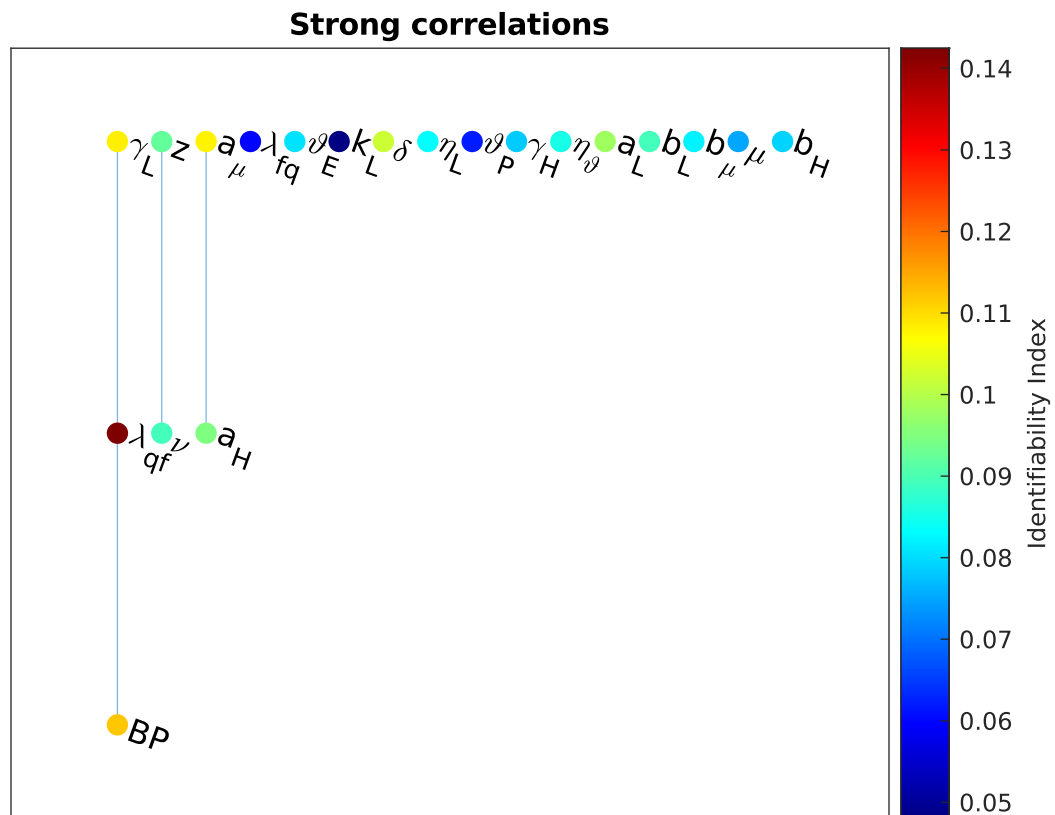
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|------------------|------------|------------|------------|------------|----------|
| \lambda_{fq} | '0' | '0.0105' | '0.0009' | '0.0016' | '0.0601' |
| \vartheta_E | '0.2951' | '0.3375' | '0.3163' | '0.8173' | '0.0806' |
| \gamma_L | '0.5672' | '0.633' | '0.6001' | '0.7262' | '0.1084' |
| k_L | '5.3517' | '5.63' | '5.4909' | '5.3209' | '0.048' |
| \lambda_{qf} | '0.2539' | '0.3173' | '0.2856' | '0.0873' | '0.1425' |
| \delta | '0.12' | '0.1282' | '0.1241' | '0.1478' | '0.102' |
| \eta_L | '0.7199' | '0.7689' | '0.7444' | '0.6241' | '0.0834' |
| \vartheta_P | '0' | '0.0077' | '0.0035' | '0.0479' | '0.0621' |
| \gamma_H | '0.5584' | '0.6057' | '0.5821' | '0.9939' | '0.0786' |
| z | '29.1578' | '30' | '29.6101' | '29.9848' | '0.0924' |
| \eta_{\vartheta} | '0.7399' | '0.783' | '0.7615' | '0.9995' | '0.0856' |
| a_L | '6.113' | '6.9211' | '6.5171' | '1.0023' | '0.098' |
| b_L | '5.0188' | '5.86' | '5.4394' | '14.993' | '0.0895' |
| a_{\mu} | '7.3161' | '8.065' | '7.6905' | '1.9742' | '0.1078' |
| b_{\mu} | '7.0941' | '7.698' | '7.3961' | '5.2873' | '0.0821' |
| \mu | '0.5199' | '0.5672' | '0.5435' | '0.6954' | '0.0753' |
| a_H | '9.1643' | '9.8175' | '9.4909' | '1.3559' | '0.095' |
| b_H | '7.4122' | '8.0666' | '7.7394' | '10.5029' | '0.0793' |
| \nu | '185.8914' | '199.3436' | '192.6175' | '89.6776' | '0.0895' |
| BP | '381.4682' | '383.5318' | '382.5' | '384.5055' | '0.112' |

11.3. Identifiability analysis

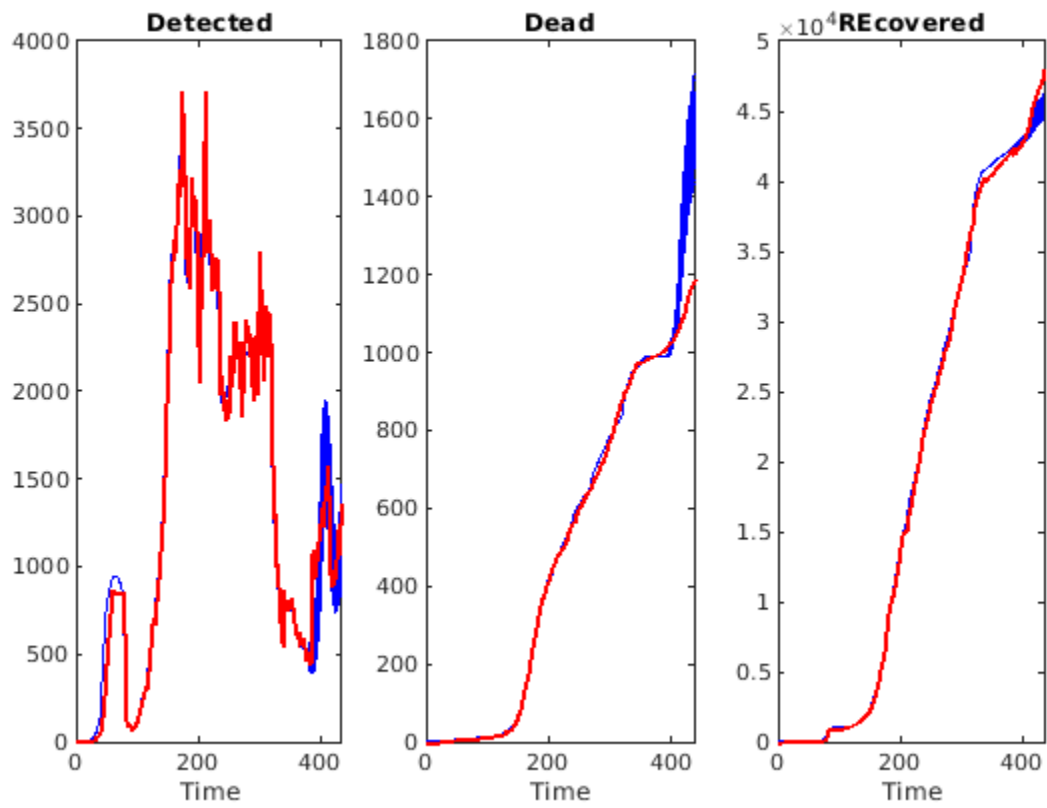






11.4. Uncertainty analysis

N=500



Chapter 12. Extension number12

12.1. Basic information

The extension to be validated consists of the time series from the data437 to the 458. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

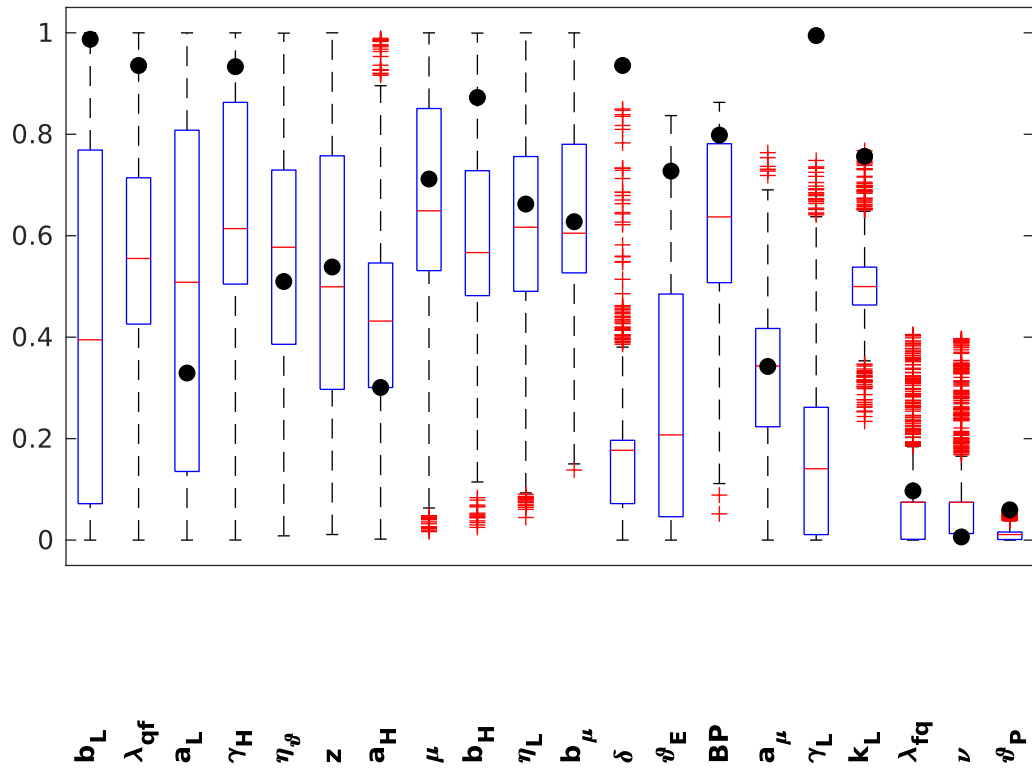
12.2. Estimated parameters with their intervals

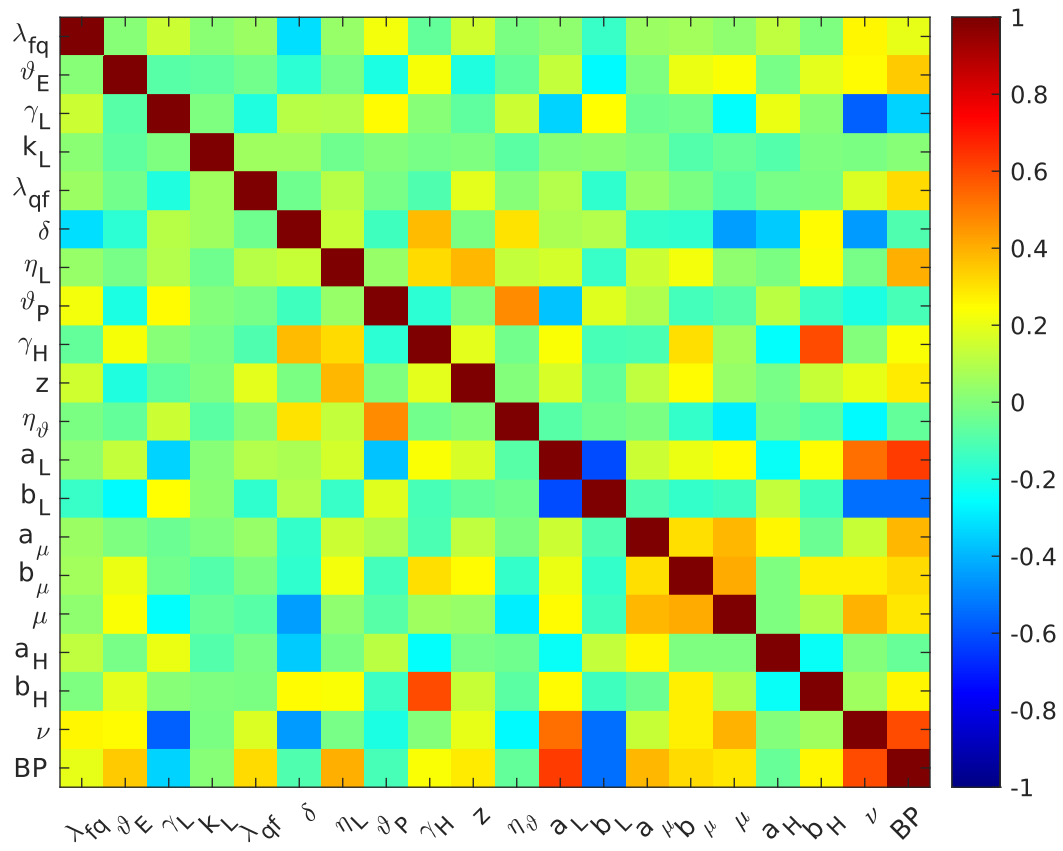
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

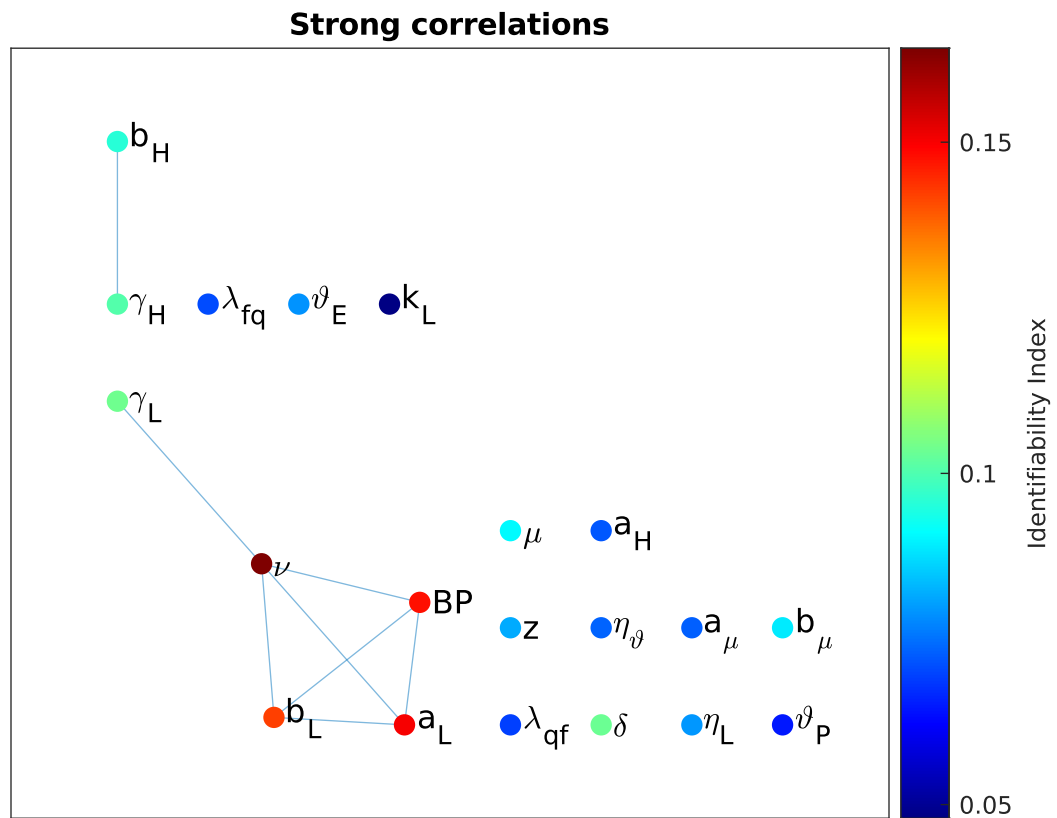
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|-----------|------------|----------|
| λ_{fq} | '0.077' | '0.2102' | '0.0746' | '0.097' | '0.0711' |
| ϑ_E | '0.5967' | '0.7355' | '0.2074' | '0.7274' | '0.0792' |
| γ_L | '0.4711' | '1' | '0.1406' | '0.9945' | '0.1042' |
| k_L | '1.18' | '10' | '5.4981' | '7.8088' | '0.0479' |
| λ_{qf} | '0.5498' | '0.9646' | '0.5551' | '0.9355' | '0.0693' |
| δ | '0.0264' | '0.15' | '0.0266' | '0.1403' | '0.1037' |
| η_L | '0.3013' | '0.8912' | '0.6168' | '0.6624' | '0.0793' |
| ϑ_P | '0.0437' | '0.1457' | '0.011' | '0.0596' | '0.0651' |
| γ_H | '0.1' | '0.955' | '0.614' | '0.9332' | '0.1009' |
| z | '11.9577' | '16.2759' | '14.9798' | '16.1511' | '0.0818' |
| η_{ϑ} | '0.3472' | '0.9426' | '0.5773' | '0.5098' | '0.0737' |
| a_L | '4.9425' | '7.2962' | '8.1147' | '5.6108' | '0.1501' |
| b_L | '9.1793' | '15' | '6.5279' | '14.821' | '0.1421' |
| a_{μ} | '3.8322' | '14.5196' | '5.8059' | '5.7922' | '0.0732' |
| b_{μ} | '1.2688' | '14.44' | '9.4692' | '9.787' | '0.0889' |
| μ | '0.025' | '0.961' | '0.6491' | '0.7118' | '0.0911' |
| a_H | '1.7919' | '13.1184' | '7.045' | '5.2116' | '0.072' |
| b_H | '3.5436' | '13.935' | '8.9351' | '13.2156' | '0.0957' |
| ν | '0.5627' | '5.9988' | '37.2329' | '3.111' | '0.1642' |
| BP | '435.3714' | '437.2718' | '425.5' | '435.4997' | '0.1475' |

12.3. Identifiability analysis

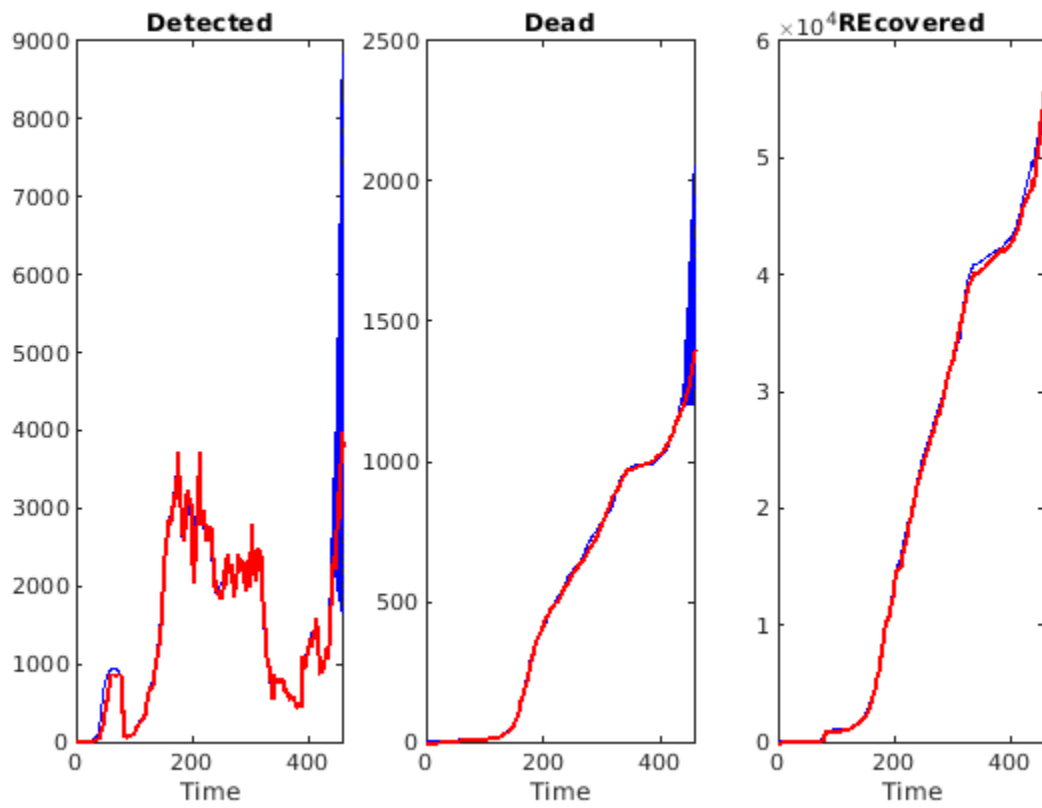






12.4. Uncertainty analysys

N=500



Chapter 13. Extension number13

13.1. Basic information

The extension to be validated consists of the time series from the data458 to the 486. The status of the validation is: COMPLETED.

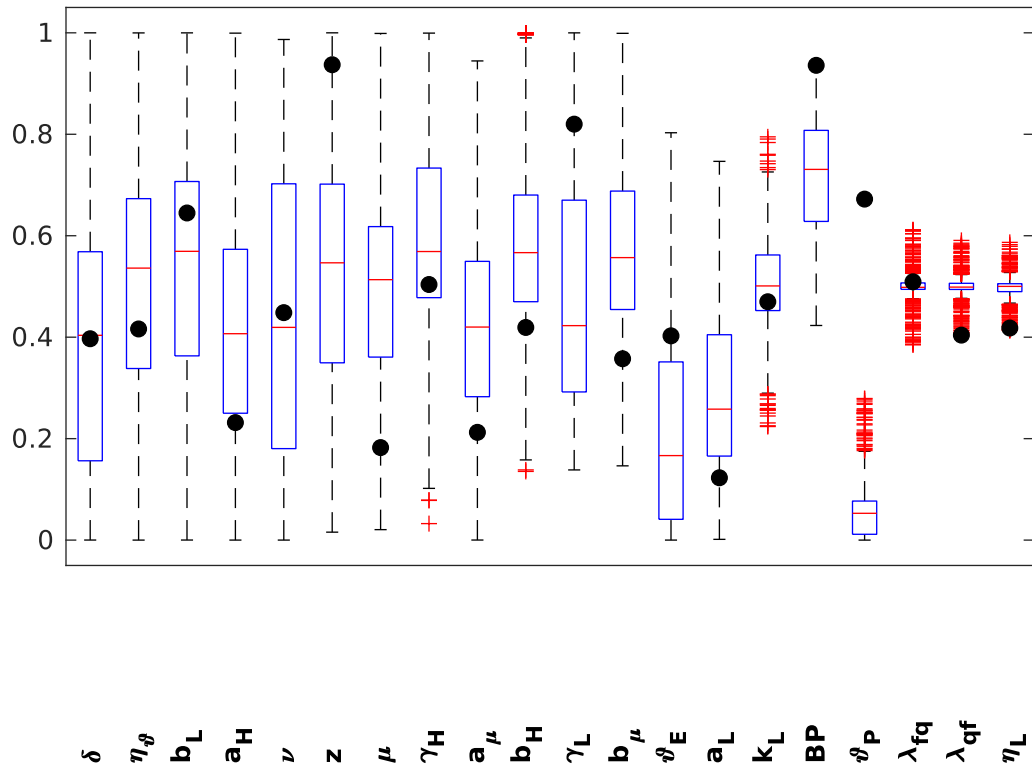
The number of estimations needed to perform the validation was1000.

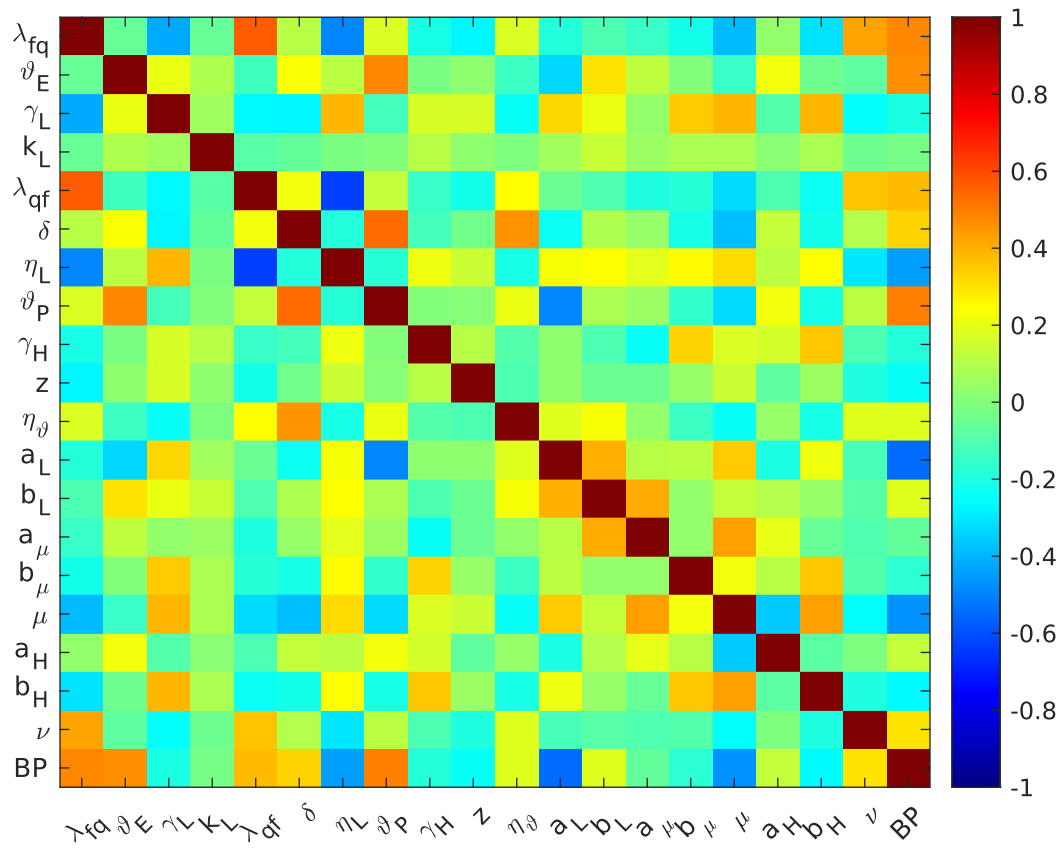
13.2. Estimated parameters with their intervals

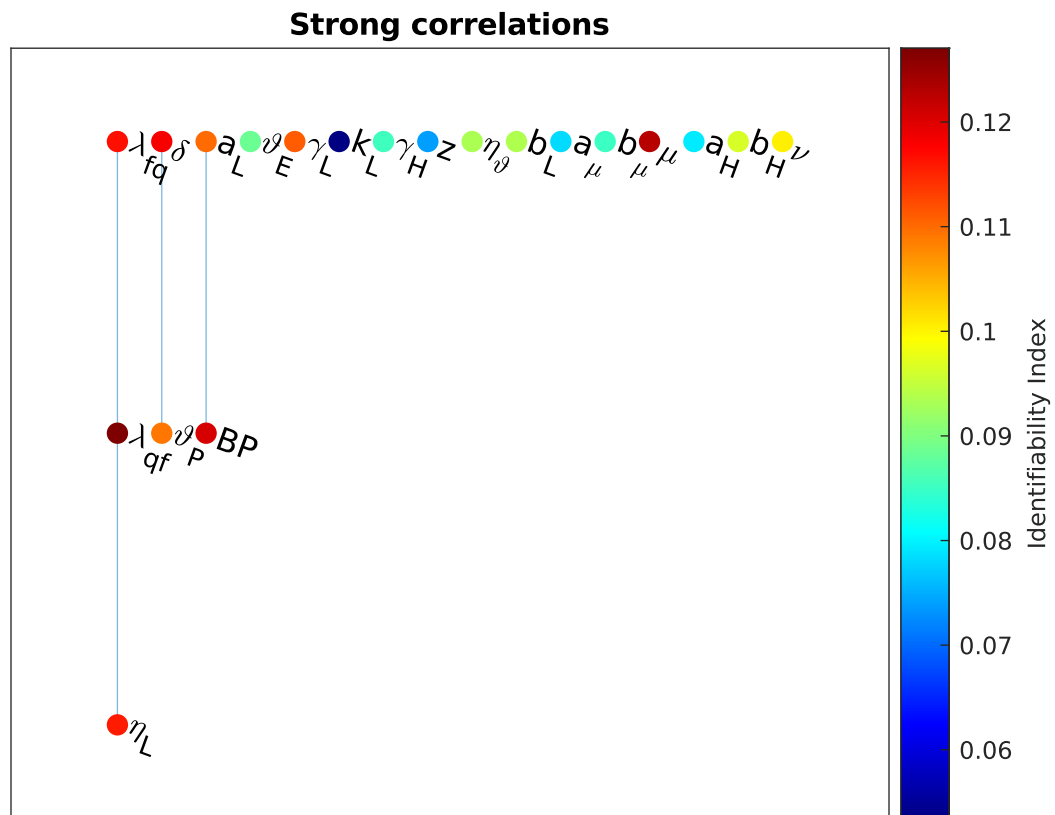
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|------------|----------|
| λ_{fq} | '0.4792' | '0.5174' | '0.4983' | '0.5092' | '0.1165' |
| ϑ_E | '0.1425' | '0.1906' | '0.1666' | '0.4027' | '0.0887' |
| γ_L | '0.3932' | '0.4523' | '0.4228' | '0.82' | '0.1112' |
| k_L | '5.3724' | '5.6464' | '5.5094' | '5.2288' | '0.0535' |
| λ_{qf} | '0.4782' | '0.5192' | '0.4987' | '0.4041' | '0.1271' |
| δ | '0.0558' | '0.0653' | '0.0606' | '0.0595' | '0.1183' |
| η_L | '0.4831' | '0.5172' | '0.5001' | '0.4181' | '0.1156' |
| ϑ_P | '0.0309' | '0.0748' | '0.0528' | '0.6722' | '0.1092' |
| γ_H | '0.5441' | '0.5936' | '0.5689' | '0.5038' | '0.0855' |
| z | '15.649' | '17.1477' | '16.3983' | '28.1133' | '0.0741' |
| η_{ϑ} | '0.5092' | '0.5632' | '0.5362' | '0.4162' | '0.0932' |
| a_L | '4.3291' | '4.8988' | '4.614' | '2.7206' | '0.11' |
| b_L | '8.5371' | '9.4022' | '8.9697' | '10.0279' | '0.0936' |
| a_{μ} | '6.5758' | '7.1834' | '6.8796' | '3.9742' | '0.0783' |
| b_{μ} | '8.488' | '9.1043' | '8.7962' | '6.005' | '0.0853' |
| μ | '0.4844' | '0.5423' | '0.5134' | '0.1824' | '0.123' |
| a_H | '6.3467' | '7.0455' | '6.6961' | '4.2431' | '0.0795' |
| b_H | '8.6269' | '9.2398' | '8.9334' | '6.8688' | '0.0963' |
| ν | '192.2046' | '227.1266' | '209.6656' | '224.1919' | '0.1006' |
| BP | '464.9516' | '466.0484' | '465.5' | '473.5' | '0.1206' |

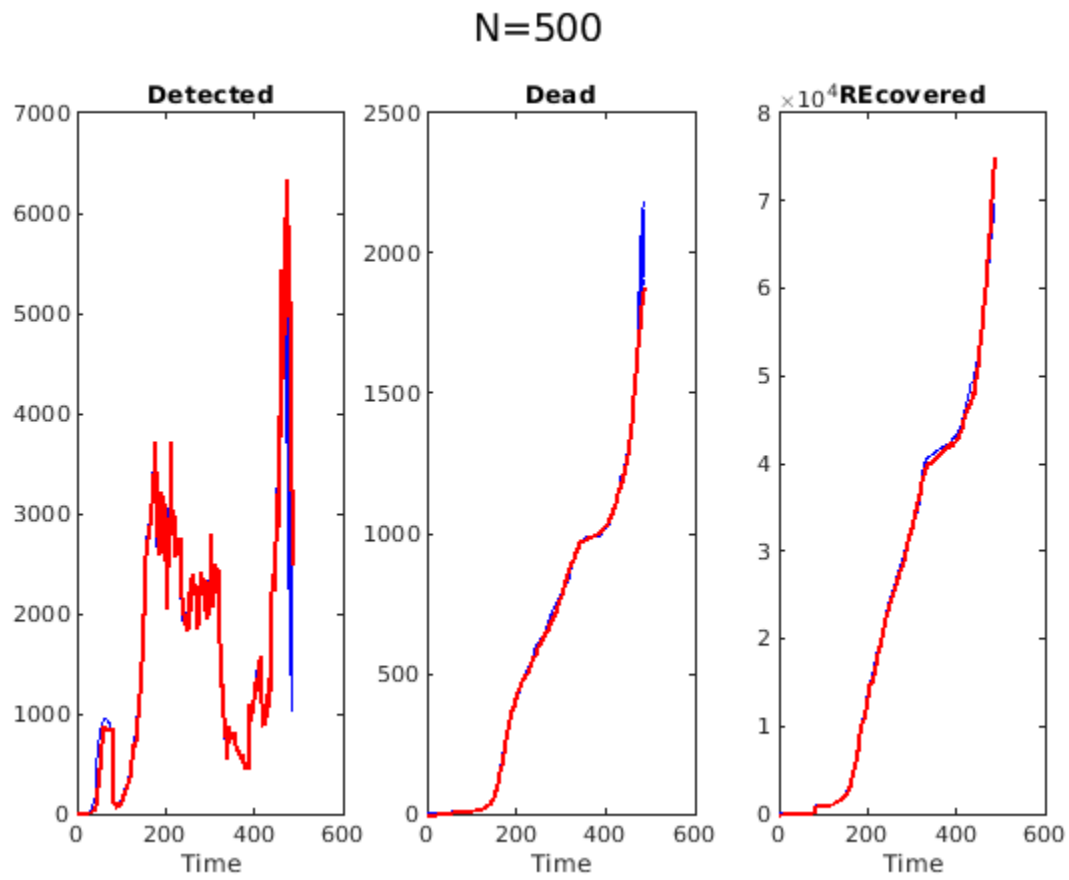
13.3. Identifiability analysis







13.4. Uncertainty analysis



Chapter 14. Extension number14

14.1. Basic information

The extension to be validated consists of the time series from the data486 to the 539. The status of the validation is: COMPLETED.

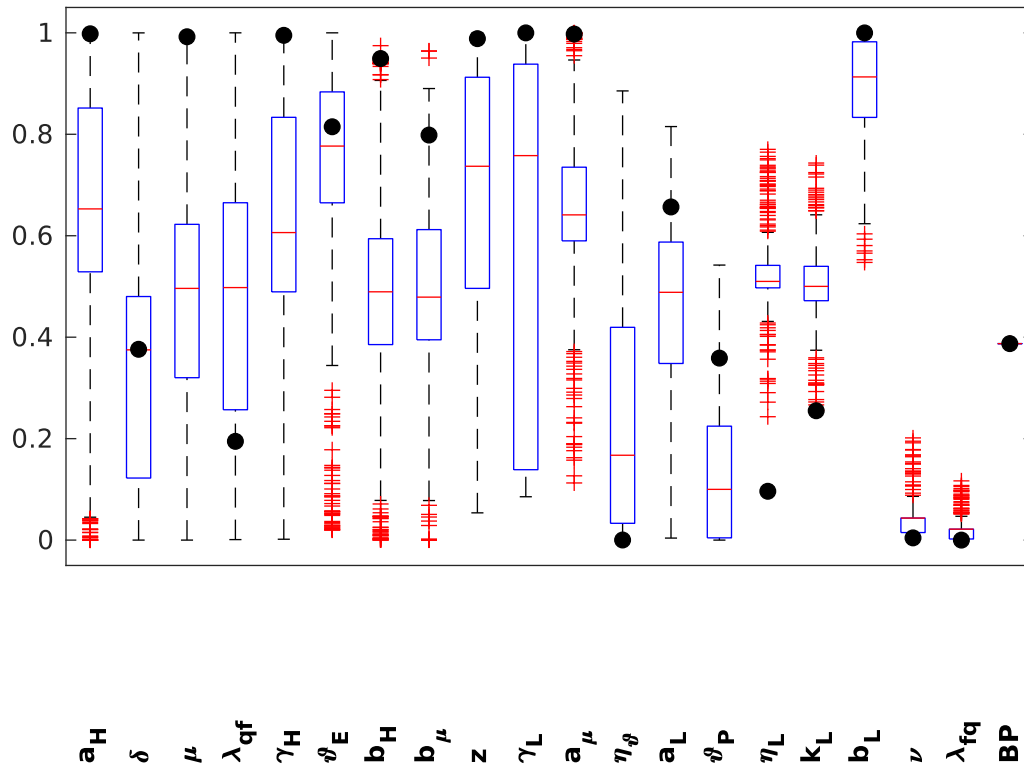
The number of estimations needed to perform the validation was1000.

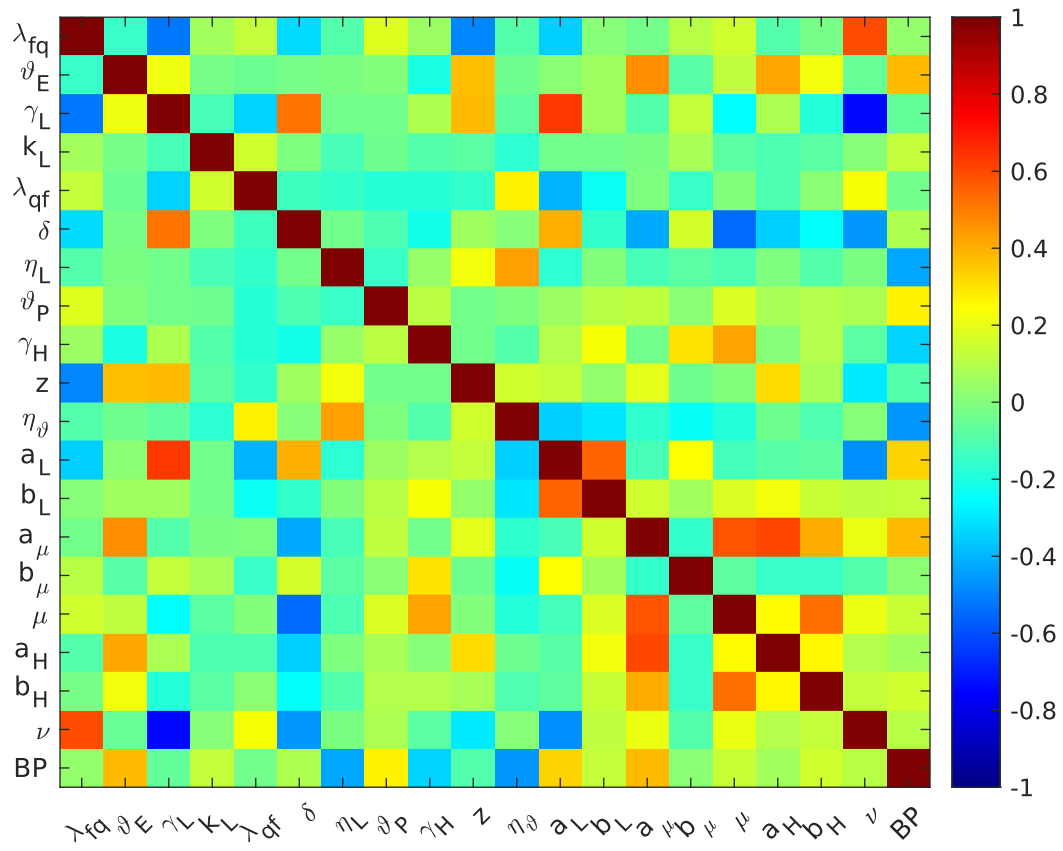
14.2. Estimated parameters with their intervals

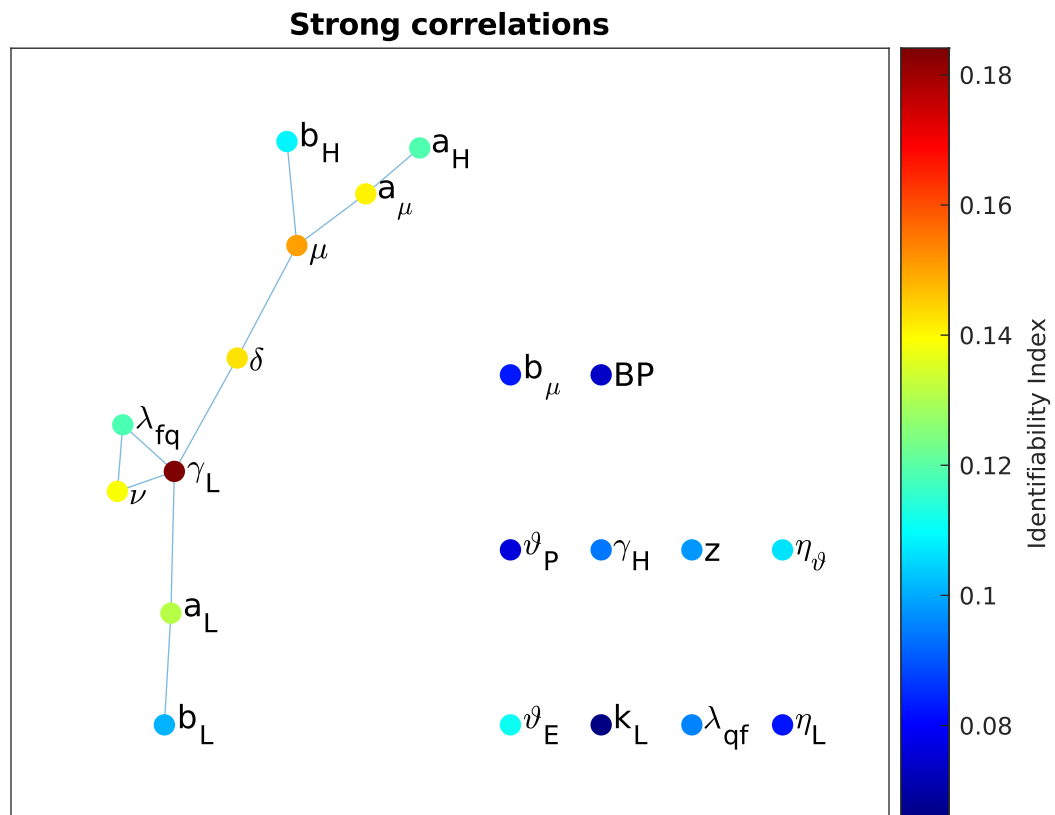
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

| | Rango | | Nominal | Mejor | Index |
|------------------|------------|------------|-----------|-----------|----------|
| \lambda_{fq} | '0' | '0.0508' | '0.0216' | '0' | '0.1189' |
| \vartheta_E | '0.7267' | '0.8268' | '0.7767' | '0.8148' | '0.1112' |
| \gamma_L | '0.7053' | '0.8106' | '0.7579' | '0.9999' | '0.1841' |
| k_L | '5.2909' | '5.712' | '5.5014' | '3.2948' | '0.0658' |
| \lambda_{qf} | '0.4631' | '0.5325' | '0.4978' | '0.1947' | '0.0956' |
| \delta | '0.0503' | '0.0622' | '0.0563' | '0.0564' | '0.1428' |
| \eta_L | '0.4808' | '0.5391' | '0.51' | '0.0962' | '0.0824' |
| \vartheta_P | '0.0716' | '0.1285' | '0.1' | '0.3588' | '0.0763' |
| \gamma_H | '0.5706' | '0.6419' | '0.6062' | '0.9951' | '0.0943' |
| z | '21.0789' | '23.1383' | '22.1086' | '29.6555' | '0.0981' |
| \eta_{\vartheta} | '0.1247' | '0.2098' | '0.1673' | '0.0002' | '0.1068' |
| a_L | '7.5094' | '8.1679' | '7.8387' | '10.1943' | '0.1311' |
| b_L | '13.3726' | '14.1935' | '13.7831' | '14.9977' | '0.1013' |
| a_{\mu} | '9.4414' | '10.5101' | '9.9758' | '14.9663' | '0.1408' |
| b_{\mu} | '7.2931' | '8.1182' | '7.7056' | '12.1786' | '0.0829' |
| \mu | '0.4596' | '0.5328' | '0.4962' | '0.9923' | '0.1505' |
| a_H | '9.5782' | '10.7026' | '10.1404' | '14.9735' | '0.1193' |
| b_H | '7.3889' | '8.316' | '7.8524' | '14.2902' | '0.1089' |
| \nu | '2.097' | '41.3461' | '21.7216' | '2.1885' | '0.1391' |
| BP | '485.2268' | '485.7732' | '485.5' | '485.5' | '0.0741' |

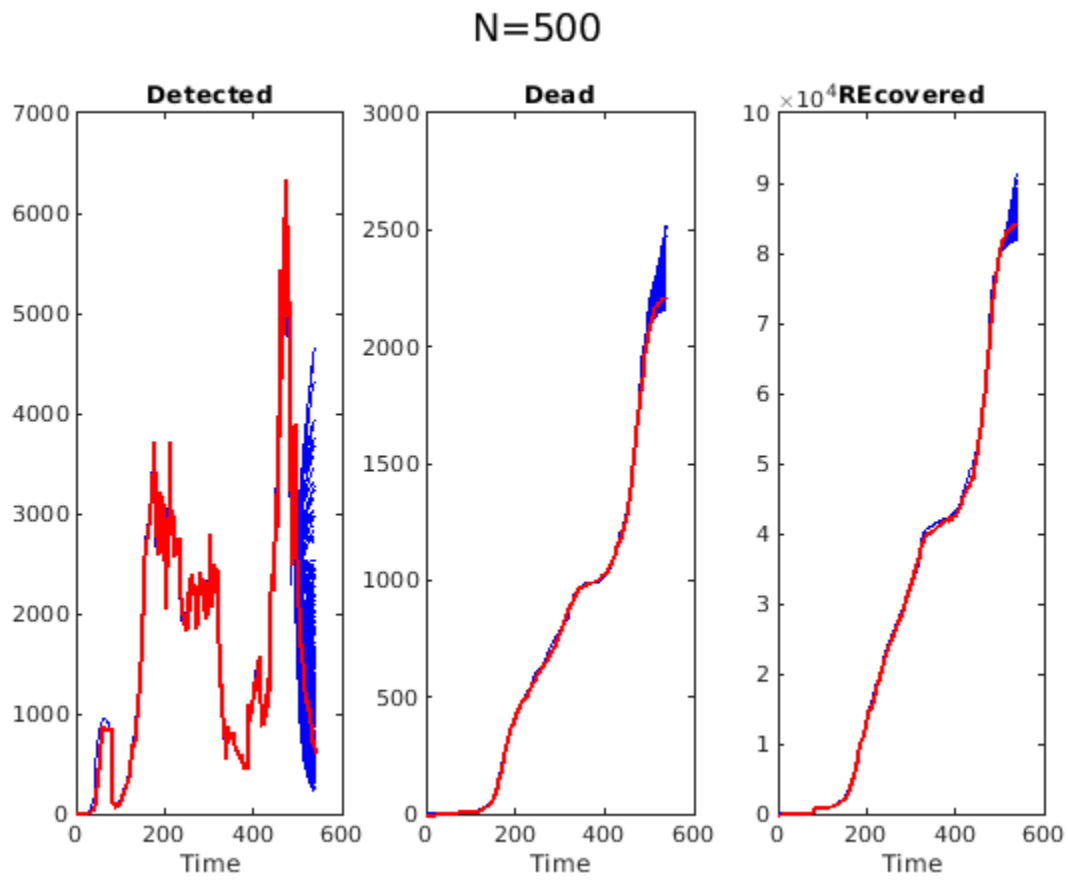
14.3. Identifiability analysis







14.4. Uncertainty analysis



Chapter 15. Extension number15

15.1. Basic information

The extension to be validated consists of the time series from the data539 to the 721. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

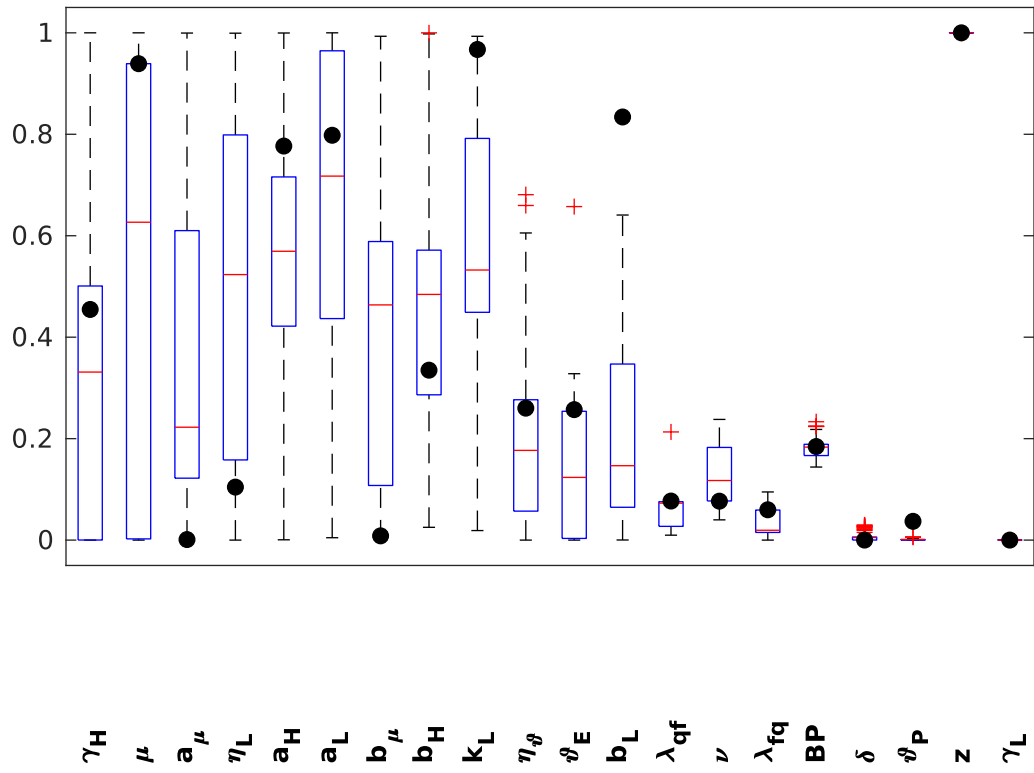
15.2. Estimated parameters with their intervals

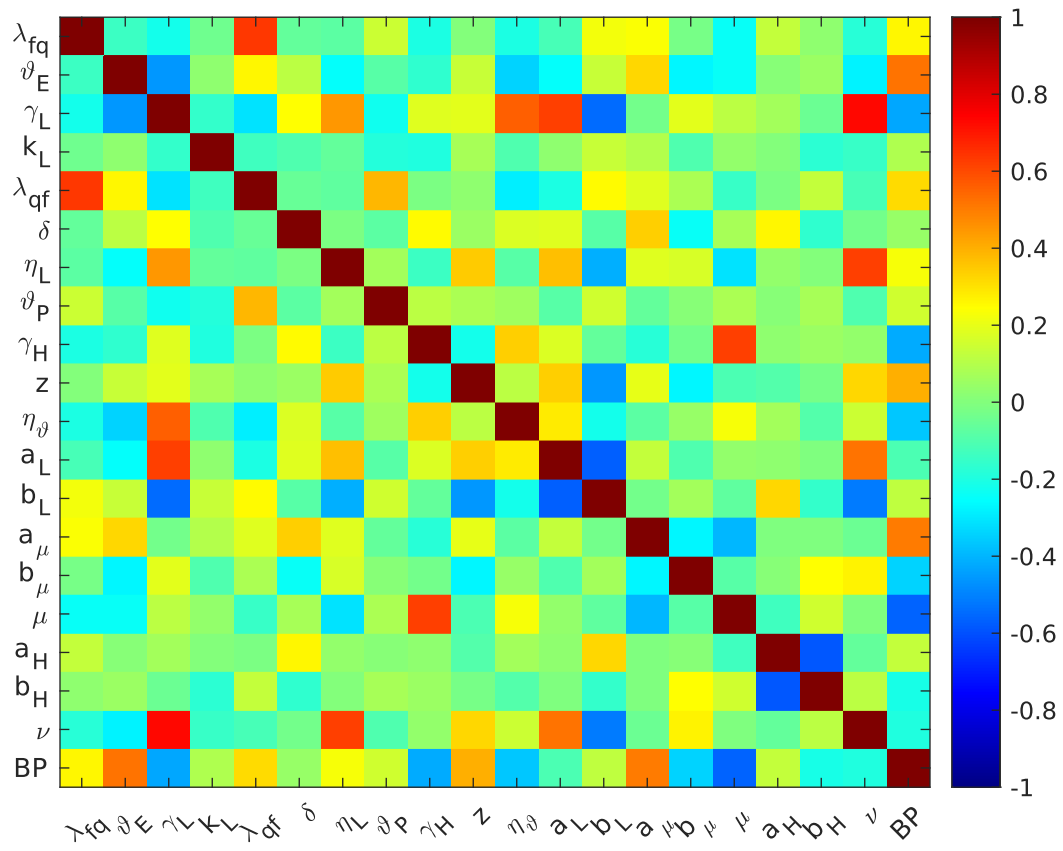
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

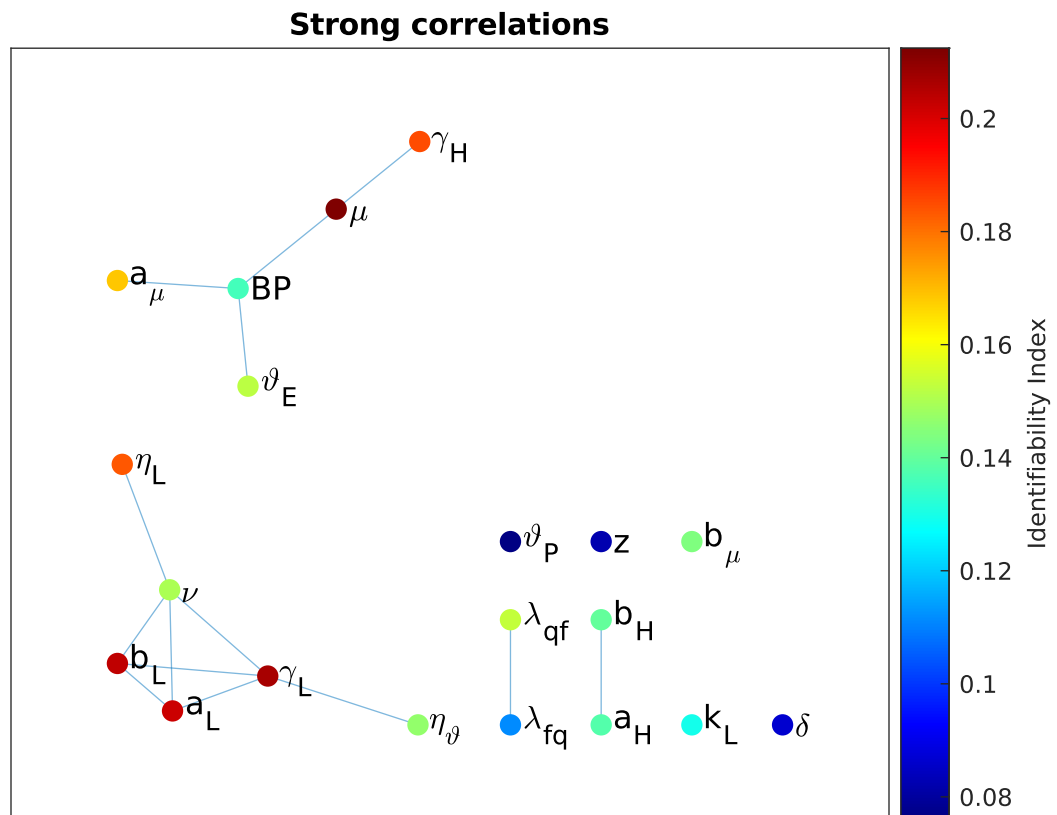
Due to a deviation from the median the CSB method was activated to obtain the parameter intervals.

| | Rango | | Nominal | Mejor | Index |
|--------------------|-----------|------------|------------|-----------|----------|
| λ_{fq} | '0.0594' | '0.0679' | '0.0213' | '0.0598' | '0.1115' |
| ϑ_E | '0.2395' | '0.3757' | '0.1265' | '0.2572' | '0.1521' |
| γ_L | '0' | '0' | '0.0001' | '0' | '0.2071' |
| k_L | '7.8518' | '9.9301' | '5.7918' | '9.7046' | '0.1296' |
| λ_{qf} | '0.0719' | '0.0863' | '0.0731' | '0.077' | '0.1529' |
| δ | '0' | '0' | '0.0009' | '0' | '0.0868' |
| η_L | '0.0293' | '0.1149' | '0.5234' | '0.1045' | '0.1834' |
| ϑ_P | '0.0311' | '0.1229' | '0.0012' | '0.037' | '0.0762' |
| γ_H | '0.2269' | '0.4601' | '0.3313' | '0.4547' | '0.1849' |
| z | '28.4514' | '30' | '29.9965' | '29.9997' | '0.0825' |
| η_{ϑ} | '0.1281' | '0.2678' | '0.178' | '0.2601' | '0.1468' |
| a_L | '6.7472' | '12.5217' | '11.0457' | '12.1729' | '0.2022' |
| b_L | '5.8288' | '12.6996' | '3.1329' | '12.6774' | '0.2034' |
| a_{μ} | '1' | '2.9602' | '4.1154' | '1.015' | '0.1685' |
| b_{μ} | '1.0373' | '2.4156' | '7.4912' | '1.1171' | '0.1443' |
| μ | '0.6027' | '0.9452' | '0.6266' | '0.9392' | '0.2124' |
| a_H | '8.6037' | '12.2416' | '8.9712' | '11.8751' | '0.1381' |
| b_H | '4.019' | '10.6951' | '7.7807' | '5.6896' | '0.1401' |
| ν | '37.1114' | '49.4147' | '59.0135' | '38.3725' | '0.1501' |
| BP | '515.5' | '628.8118' | '526.9998' | '527.5' | '0.1361' |

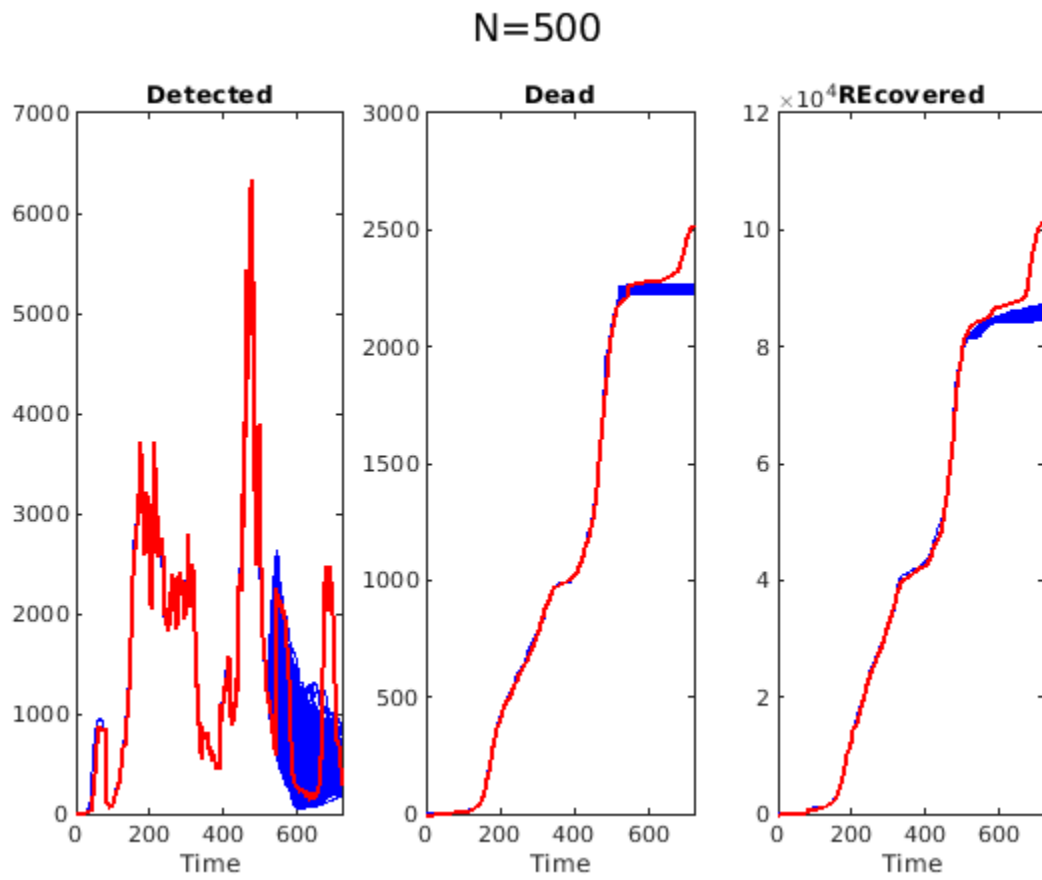
15.3. Identifiability analysis







15.4. Uncertainty analysys



Chapter 16. Extension number16

16.1. Basic information

The extension to be validated consists of the time series from the data721 to the 737. The status of the validation is: COMPLETED.

The number of estimations needed to perform the validation was1000.

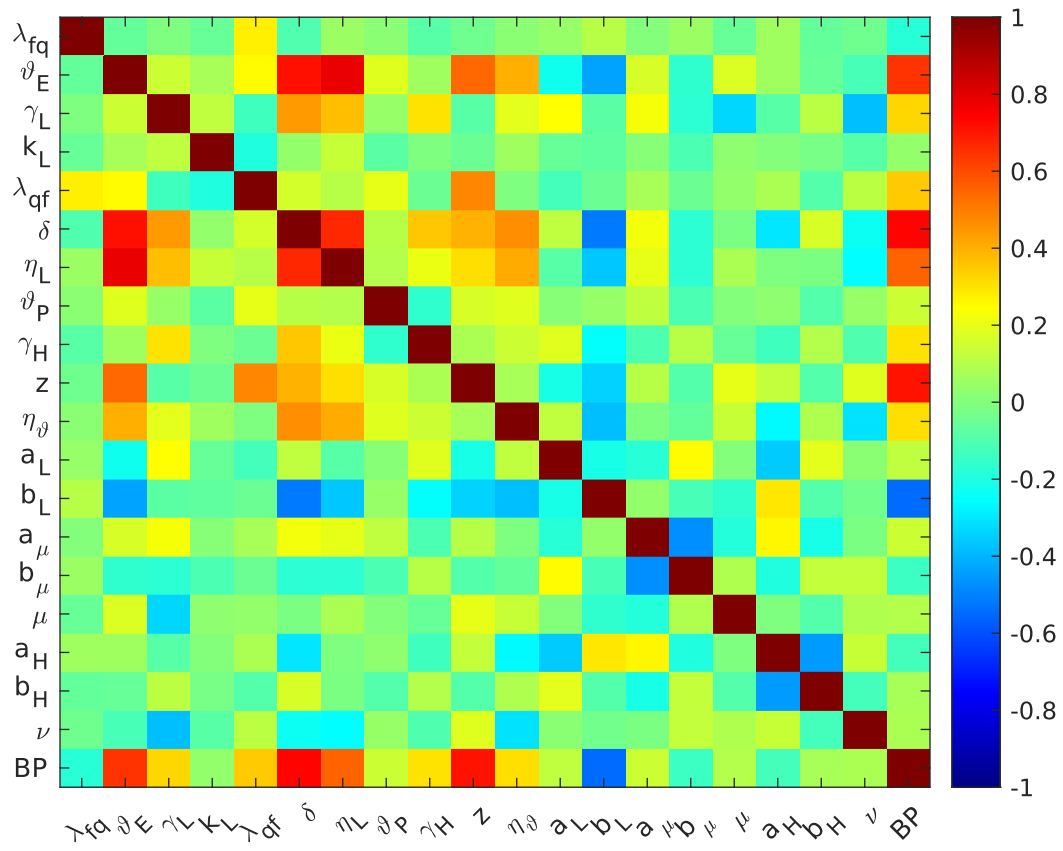
16.2. Estimated parameters with their intervals

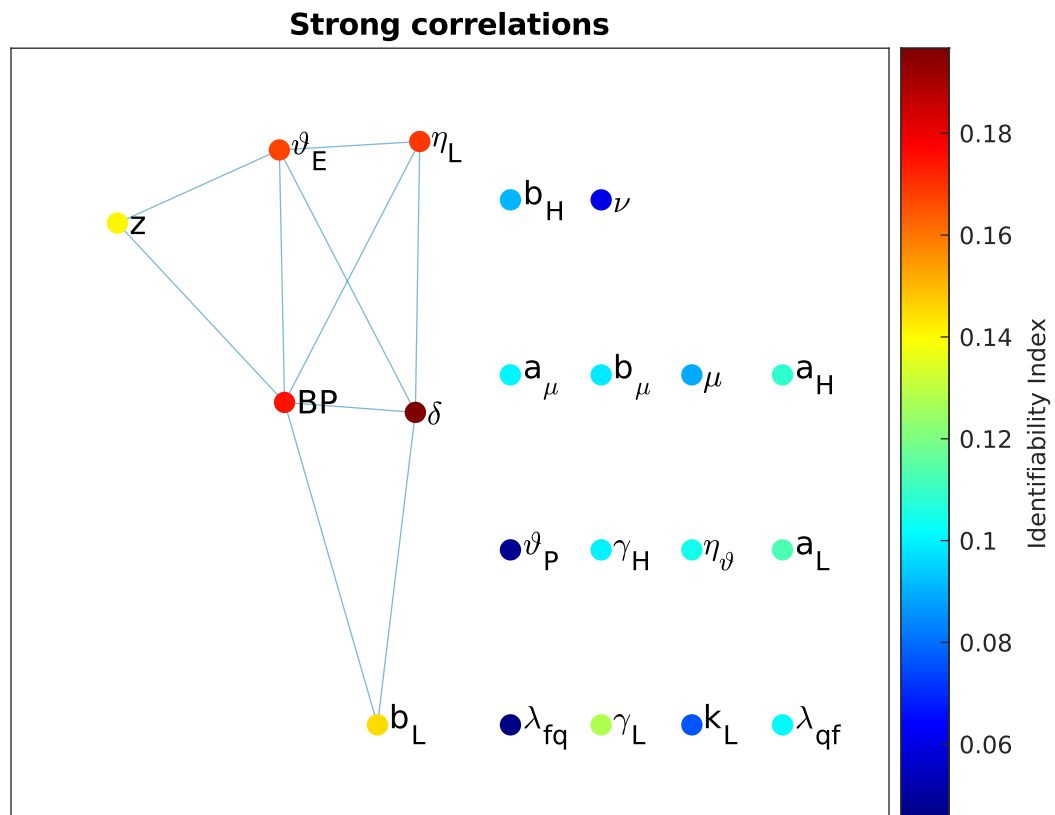
It was necessary to fix 0 parameters of 10 that could be fixed to complete validation.

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

| | Rango | | Nominal | Mejor | Index |
|--------------------|------------|------------|------------|-----------|----------|
| λ_{fq} | '0' | '0' | '0' | '0' | '0.0455' |
| ϑ_E | '0' | '0.0001' | '0.0003' | '0' | '0.1678' |
| γ_L | '0.7654' | '0.9682' | '0.4562' | '0.9642' | '0.1277' |
| k_L | '4.6296' | '8.117' | '5.6335' | '7.7456' | '0.0762' |
| λ_{qf} | '0.0066' | '0.0181' | '0.1019' | '0.0146' | '0.1013' |
| δ | '0.037' | '0.0699' | '0.0313' | '0.0696' | '0.1967' |
| η_L | '0.3862' | '0.5353' | '0.2273' | '0.5313' | '0.1694' |
| ϑ_P | '0' | '0' | '0' | '0' | '0.0482' |
| γ_H | '0.7439' | '0.9487' | '0.7173' | '0.9436' | '0.0999' |
| z | '9.0808' | '15.0992' | '13.6264' | '9.0815' | '0.1406' |
| η_{ϑ} | '0.6375' | '0.6745' | '0.6197' | '0.6395' | '0.1048' |
| a_L | '14.2413' | '15' | '8.3232' | '14.9262' | '0.1131' |
| b_L | '4.8317' | '6.1999' | '5.7028' | '4.9321' | '0.1448' |
| a_{μ} | '4.4973' | '6.8075' | '5.1606' | '4.7895' | '0.1009' |
| b_{μ} | '4.0486' | '6.7838' | '8.6933' | '6.4964' | '0.0991' |
| μ | '0.1803' | '0.5527' | '0.5669' | '0.521' | '0.0894' |
| a_H | '1.2951' | '1.621' | '5.3449' | '1.5883' | '0.1089' |
| b_H | '1.4877' | '5.0103' | '8.5104' | '1.7529' | '0.0915' |
| ν | '0.0002' | '0.0003' | '1.0098' | '0.0002' | '0.0603' |
| BP | '605.9316' | '720.9466' | '623.4984' | '623.5' | '0.1744' |







16.4. Uncertainty analysys

