```
Python 3.6.4 |Anaconda custom (64-bit)| (default, Jan 16 2018, 10:22:32) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 6.2.1 -- An enhanced Interactive Python.

In [1]: runfile('E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test/test_QB.py', wdir='E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test')
Directory:
E:\Daniel\Projects\PhD-RL-Toulouse\projects
has been prepended to the module search path.
System: # servers=3, K=5, rhos=[0.4, 0.75, 0.35], buffer_size_activation=2

*** Running simulation for nparticles=200 (1 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1717)...
Range of particle indices to simulate with start state #1 out of 6: [0, 17] (n=18, n/N=0.09, p=0.103393, diff=-0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [18, 59] (n=42, n/N=0.21, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [60, 81] (n=22, n/N=0.11, p=0.090468, diff=0.2%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [82, 146] (n=65, n/N=0.325, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [147, 184] (n=38, n/N=0.19, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [185, 199] (n=15, n/N=0.075, p=0.079160, diff=-0.1%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=14285.7 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 437 out of N=200
execution time: 1.4 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #1 out of 3: [0, 49] (n=50, n/N=0.25, p=0.266667, diff=-0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [50, 150] (n=101, n/N=0.505, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [151, 199] (n=49, n/N=0.245, p=0.233333, diff=0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 200 (N=200)
execution time: 50.6 sec, 0.8 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1719)...
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Range of particle indices to simulate with start state #3 out of 6: [0, 0] (n=1, n/N=1.0, p=0.090468, diff=10.1%, state=[1, 0, 1])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=42857.1 or #events=50087)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=2128.444, n=3995
P=0: Blocking time AFTER removal: t=2128.444, n=3995
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 10926 (41.5% of simulation time T=42857.1)
execution time: 55.4 sec, 0.9 min
execution time MC + FV: 106.0 sec, 1.8 min
Computing TRUE blocking probability for nservers=3, K=5, rhos=[0.4, 0.75, 0.35]...
        P(K) by MC: 11.957912% (simulation time = 42857.1)
        P(K) estimated by FV: 12.835514%, E(T) = 3.9 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1727)...
Range of particle indices to simulate with start state #1 out of 6: [0, 21] (n=22, n/N=0.11, p=0.103393, diff=0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [22, 60] (n=39, n/N=0.195, p=0.193861, diff=0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [61, 83] (n=23, n/N=0.115, p=0.090468, diff=0.3%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [84, 155] (n=72, n/N=0.36, p=0.363489, diff=-0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [156, 184] (n=29, n/N=0.145, p=0.169628, diff=-0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [185, 199] (n=15, n/N=0.075, p=0.079160, diff=-0.1%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=14285.7 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 385 out of N=200
execution time: 1.6 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1727)...
Range of particle indices to simulate with start state #1 out of 3: [0, 56] (n=57, n/N=0.285, p=0.266667, diff=0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [57, 157] (n=101, n/N=0.505, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [158, 199] (n=42, n/N=0.21, p=0.233333, diff=-0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 200 (N=200)
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execution time: 50.6 sec, 0.8 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1729)...
Range of particle indices to simulate with start state #2 out of 6: [0, 0] (n=1, n/N=1.0, p=0.193861, diff=4.2%, state=[1, 1, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=42857.1 or #events=49912)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=2222.574, n=4226
P=0: Blocking time AFTER removal: t=2222.574, n=4226
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 10739 (41.5% of simulation time T=42857.1)
execution time: 45.2 sec, 0.8 min
execution time MC + FV: 95.9 sec, 1.6 min
        P(K) by MC: 12.506254% (simulation time = 42857.1)
        P(K) estimated by FV: 11.131901%, E(T) = 3.0 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 3 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1737)...
Range of particle indices to simulate with start state #1 out of 6: [0, 18] (n=19, n/N=0.095, p=0.103393, diff=-0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [19, 63] (n=45, n/N=0.225, p=0.193861, diff=0.2%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [64, 82] (n=19, n/N=0.095, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [83, 145] (n=63, n/N=0.315, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [146, 188] (n=43, n/N=0.215, p=0.169628, diff=0.3%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [189, 199] (n=11, n/N=0.055, p=0.079160, diff=-0.3%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=14285.7 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 419 out of N=200
execution time: 1.5 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1737)...
Range of particle indices to simulate with start state #1 out of 3: [0, 54] (n=55, n/N=0.275, p=0.266667, diff=0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [55, 151] (n=97, n/N=0.485, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [152, 199] (n=48, n/N=0.24, p=0.233333, diff=0.0%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
```

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Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 200 (N=200)
execution time: 58.2 sec, 1.0 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1739)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=42857.1 or #events=50063)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=2136.861, n=3995
P=0: [<EventType.BLOCK: 9>] events at time 17769.9 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 17769.9 removed.
P=0: [<EventType.BLOCK: 9>] events at time 17772.3 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 17772.5 removed.
P=0: [<EventType.BLOCK: 9>] events at time 17773.1 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 17773.2 removed.
P=0: [<EventType.BLOCK: 9>] events at time 17773.6 removed.
P=0: Blocking time AFTER removal: t=2136.475, n=3992
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 10846 (41.5% of simulation time T=42857.1)
execution time: 45.1 sec, 0.8 min
execution time MC + FV: 103.4 sec, 1.7 min
        P(K) by MC: 12.023358% (simulation time = 42857.1)
        P(K) estimated by FV: 11.900078%, E(T) = 3.3 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 4 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1747)...
Range of particle indices to simulate with start state #1 out of 6: [0, 22] (n=23, n/N=0.115, p=0.103393, diff=0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [23, 52] (n=30, n/N=0.15, p=0.193861, diff=-0.2%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [53, 68] (n=16, n/N=0.08, p=0.090468, diff=-0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [69, 149] (n=81, n/N=0.405, p=0.363489, diff=0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [150, 181] (n=32, n/N=0.16, p=0.169628, diff=-0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [182, 199] (n=18, n/N=0.09, p=0.079160, diff=0.1%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=14285.7 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 452 out of N=200
execution time: 2.9 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1747)...
```

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Range of particle indices to simulate with start state #1 out of 3: [0, 49] (n=50, n/N=0.25, p=0.266667, diff=-0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [50, 151] (n=102, n/N=0.51, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [152, 199] (n=48, n/N=0.24, p=0.233333, diff=0.0%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 200 (N=200)
execution time: 57.1 sec, 1.0 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1749)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=42857.1 or #events=49807)...
Finalizing and identifying measurement times...
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 10827 (41.3% of simulation time T=42857.1)
execution time: 59.2 sec, 1.0 min
execution time MC + FV: 116.5 sec, 1.9 min
        P(K) by MC: 11.917556% (simulation time = 42857.1)
        P(K) estimated by FV: 13.062348%, E(T) = 3.3 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 5 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1757)...
Range of particle indices to simulate with start state #1 out of 6: [0, 23] (n=24, n/N=0.12, p=0.103393, diff=0.2%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [24, 66] (n=43, n/N=0.215, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [67, 91] (n=25, n/N=0.125, p=0.090468, diff=0.4%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [92, 154] (n=63, n/N=0.315, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [155, 188] (n=34, n/N=0.17, p=0.169628, diff=0.0%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [189, 199] (n=11, n/N=0.055, p=0.079160, diff=-0.3%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=14285.7 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 421 out of N=200
execution time: 1.4 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1757)...
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Range of particle indices to simulate with start state #1 out of 3: [0, 59] (n=60, n/N=0.3, p=0.266667, diff=0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [60, 157] (n=98, n/N=0.49, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [158, 199] (n=42, n/N=0.21, p=0.233333, diff=-0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 200 (N=200)
C:\ProgramData\Anaconda\Anaconda3\lib\site-packages\matplotlib\pyplot.py:528: RuntimeWarning: More than 20 figures have been opened. Figures created through
the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed and may consume too much memory. (To control this warning, see the
rcParam `figure.max_open_warning`).
  max_open_warning, RuntimeWarning)
execution time: 53.9 sec, 0.9 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1759)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=42857.1 or #events=49713)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=2161.529, n=3946
P=0: [<EventType.ABSORPTION: 0>] events at time 17671.6 removed.
P=0: Blocking time AFTER removal: t=2161.529, n=3946
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 10913 (41.2% of simulation time T=42857.1)
execution time: 50.2 sec, 0.8 min
execution time MC + FV: 104.2 sec, 1.7 min
        P(K) by MC: 12.232061% (simulation time = 42857.1)
        P(K) estimated by FV: 12.899731%, E(T) = 3.1 (simulation time = 71.4)
        True P(K): 11.987462%
Results:
   K BSA    N replication    Pr(MC)      Time(MC) # Events(MC) # Cycles(MC)  \
1  5   2  200           1  0.119579  17799.464175        50087        10926
1  5   2  200           2  0.125063  17771.701088        49912        10739
1  5   2  200           3  0.120234  17769.369134        50063        10846
1  5   2  200           4  0.119176  17717.673329        49807        10827
1  5   2  200           5  0.122321  17671.011406        49713        10913

       E(T) # Cycles(E(T))    Pr(FV)      Time(FV) # Events(FV)  \
1  3.936576            200  0.128355  14285.714286        50087
1  2.966620            200  0.111319  14285.714286        49912
1  3.317763            200  0.119001  14285.714286        50063
1  3.347408            200  0.130623  14285.714286        49807
1  3.108353            200  0.128997  14285.714286        49713
```

```
  # Samples Surv     Pr(K)  seed   exec_time
1            200  0.119875  1719  105.996997
1            200  0.119875  1729   95.914953
1            200  0.119875  1739  103.422116
1            200  0.119875  1749  116.488680
1            200  0.119875  1759  104.218442

*** Running simulation for nparticles=400 (2 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1717)...
Range of particle indices to simulate with start state #1 out of 6: [0, 32] (n=33, n/N=0.0825, p=0.103393, diff=-0.2%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [33, 115] (n=83, n/N=0.2075, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [116, 153] (n=38, n/N=0.095, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [154, 294] (n=141, n/N=0.3525, p=0.363489, diff=-0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [295, 373] (n=79, n/N=0.1975, p=0.169628, diff=0.2%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [374, 399] (n=26, n/N=0.065, p=0.079160, diff=-0.2%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=28571.4 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 879 out of N=400
execution time: 3.1 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #1 out of 3: [0, 103] (n=104, n/N=0.26, p=0.266667, diff=-0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [104, 301] (n=198, n/N=0.495, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [302, 399] (n=98, n/N=0.245, p=0.233333, diff=0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 400 (N=400)
execution time: 111.2 sec, 1.9 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1719)...
Range of particle indices to simulate with start state #3 out of 6: [0, 0] (n=1, n/N=1.0, p=0.090468, diff=10.1%, state=[1, 0, 1])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=85714.3 or #events=99787)...
```

```
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=4278.948, n=8069
P=0: [<EventType.ABSORPTION: 0>] events at time 35397.1 removed.
P=0: Blocking time AFTER removal: t=4278.948, n=8069
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 21701 (41.3% of simulation time T=85714.3)
execution time: 123.2 sec, 2.1 min
execution time MC + FV: 234.5 sec, 3.9 min
        P(K) by MC: 12.088685% (simulation time = 85714.3)
        P(K) estimated by FV: 12.838739%, E(T) = 3.3 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1727)...
Range of particle indices to simulate with start state #1 out of 6: [0, 42] (n=43, n/N=0.1075, p=0.103393, diff=0.0%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [43, 119] (n=77, n/N=0.1925, p=0.193861, diff=-0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [120, 160] (n=41, n/N=0.1025, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [161, 299] (n=139, n/N=0.3475, p=0.363489, diff=-0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [300, 374] (n=75, n/N=0.1875, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [375, 399] (n=25, n/N=0.0625, p=0.079160, diff=-0.2%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=28571.4 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 799 out of N=400
execution time: 2.7 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1727)...
Range of particle indices to simulate with start state #1 out of 3: [0, 106] (n=107, n/N=0.2675, p=0.266667, diff=0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [107, 307] (n=201, n/N=0.5025, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [308, 399] (n=92, n/N=0.23, p=0.233333, diff=-0.0%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 400 (N=400)
execution time: 104.2 sec, 1.7 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1729)...
Range of particle indices to simulate with start state #2 out of 6: [0, 0] (n=1, n/N=1.0, p=0.193861, diff=4.2%, state=[1, 1, 0])
```

```
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=85714.3 or #events=101115)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=4430.351, n=8538
P=0: Blocking time AFTER removal: t=4430.351, n=8538
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 21695 (42.0% of simulation time T=85714.3)
execution time: 93.9 sec, 1.6 min
execution time MC + FV: 198.3 sec, 3.3 min
        P(K) by MC: 12.319912% (simulation time = 85714.3)
        P(K) estimated by FV: 11.923090%, E(T) = 3.3 (simulation time = 71.4)
        True P(K): 11.987462%



        Replication 3 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1737)...
Range of particle indices to simulate with start state #1 out of 6: [0, 32] (n=33, n/N=0.0825, p=0.103393, diff=-0.2%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [33, 119] (n=87, n/N=0.2175, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [120, 159] (n=40, n/N=0.1, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [160, 297] (n=138, n/N=0.345, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [298, 372] (n=75, n/N=0.1875, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [373, 399] (n=27, n/N=0.0675, p=0.079160, diff=-0.1%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=28571.4 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 848 out of N=400
execution time: 3.8 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1737)...
Range of particle indices to simulate with start state #1 out of 3: [0, 106] (n=107, n/N=0.2675, p=0.266667, diff=0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [107, 311] (n=205, n/N=0.5125, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [312, 399] (n=88, n/N=0.22, p=0.233333, diff=-0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 400 (N=400)
execution time: 107.1 sec, 1.8 min
        --> Running Monte-Carlo estimation...
```

```
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1739)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=85714.3 or #events=100176)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=4199.986, n=7919
P=0: [<EventType.BLOCK: 9>] events at time 35568.1 removed.
P=0: Blocking time AFTER removal: t=4199.986, n=7919
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 21911 (41.5% of simulation time T=85714.3)
execution time: 92.2 sec, 1.5 min
execution time MC + FV: 199.5 sec, 3.3 min
        P(K) by MC: 11.808499% (simulation time = 85714.3)
        P(K) estimated by FV: 11.990197%, E(T) = 3.5 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 4 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1747)...
Range of particle indices to simulate with start state #1 out of 6: [0, 43] (n=44, n/N=0.11, p=0.103393, diff=0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [44, 122] (n=79, n/N=0.1975, p=0.193861, diff=0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [123, 165] (n=43, n/N=0.1075, p=0.090468, diff=0.2%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [166, 308] (n=143, n/N=0.3575, p=0.363489, diff=-0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [309, 371] (n=63, n/N=0.1575, p=0.169628, diff=-0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [372, 399] (n=28, n/N=0.07, p=0.079160, diff=-0.1%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=28571.4 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 757 out of N=400
execution time: 2.4 sec, 0.0 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1747)...
Range of particle indices to simulate with start state #1 out of 3: [0, 109] (n=110, n/N=0.275, p=0.266667, diff=0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [110, 311] (n=202, n/N=0.505, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [312, 399] (n=88, n/N=0.22, p=0.233333, diff=-0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
```

```
        --> Number of observations for P(T>t) estimation from FV simulation: 400 (N=400)
execution time: 103.3 sec, 1.7 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1749)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=85714.3 or #events=98874)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=4205.226, n=8053
P=0: Blocking time AFTER removal: t=4205.226, n=8053
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 21573 (40.9% of simulation time T=85714.3)
execution time: 93.9 sec, 1.6 min
execution time MC + FV: 197.4 sec, 3.3 min
        P(K) by MC: 11.994980% (simulation time = 85714.3)
        P(K) estimated by FV: 11.346368%, E(T) = 3.0 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 5 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1757)...
Range of particle indices to simulate with start state #1 out of 6: [0, 46] (n=47, n/N=0.1175, p=0.103393, diff=0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [47, 127] (n=81, n/N=0.2025, p=0.193861, diff=0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [128, 172] (n=45, n/N=0.1125, p=0.090468, diff=0.2%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [173, 294] (n=122, n/N=0.305, p=0.363489, diff=-0.2%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [295, 367] (n=73, n/N=0.1825, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [368, 399] (n=32, n/N=0.08, p=0.079160, diff=0.0%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=28571.4 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 836 out of N=400
execution time: 3.7 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1757)...
Range of particle indices to simulate with start state #1 out of 3: [0, 112] (n=113, n/N=0.2825, p=0.266667, diff=0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [113, 299] (n=187, n/N=0.4675, p=0.500000, diff=-0.1%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [300, 399] (n=100, n/N=0.25, p=0.233333, diff=0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
```

```
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 400 (N=400)
execution time: 101.4 sec, 1.7 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1759)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=85714.3 or #events=99597)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=4349.067, n=8086
P=0: [<EventType.ABSORPTION: 0>] events at time 35279.7 removed.
P=0: Blocking time AFTER removal: t=4349.067, n=8086
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 21752 (41.2% of simulation time T=85714.3)
execution time: 92.8 sec, 1.5 min
execution time MC + FV: 194.4 sec, 3.2 min
        P(K) by MC: 12.327464% (simulation time = 85714.3)
        P(K) estimated by FV: 13.289039%, E(T) = 3.4 (simulation time = 71.4)
        True P(K): 11.987462%
Results:
   K BSA    N replication    Pr(MC)      Time(MC) # Events(MC) # Cycles(MC)  \
1  5   2  200           1  0.119579  17799.464175        50087        10926
1  5   2  200           2  0.125063  17771.701088        49912        10739
1  5   2  200           3  0.120234  17769.369134        50063        10846
1  5   2  200           4  0.119176  17717.673329        49807        10827
1  5   2  200           5  0.122321  17671.011406        49713        10913
2  5   2  400           1  0.120887  35396.303972        99787        21701
2  5   2  400           2  0.123199  35960.900309       101115        21695
2  5   2  400           3  0.118085  35567.480320       100176        21911
2  5   2  400           4  0.119950  35058.216146        98874        21573
2  5   2  400           5  0.123275  35279.498311        99597        21752

       E(T) # Cycles(E(T))    Pr(FV)      Time(FV) # Events(FV)  \
1  3.936576            200  0.128355  14285.714286        50087
1  2.966620            200  0.111319  14285.714286        49912
1  3.317763            200  0.119001  14285.714286        50063
1  3.347408            200  0.130623  14285.714286        49807
1  3.108353            200  0.128997  14285.714286        49713
2  3.327745            400  0.128387  28571.428571        99787
2  3.252857            400  0.119231  28571.428571       101115
2  3.537154            400  0.119902  28571.428571       100176
2  3.034370            400  0.113464  28571.428571        98874
2  3.364890            400  0.132890  28571.428571        99597

  # Samples Surv     Pr(K)  seed   exec_time
1            200  0.119875  1719  105.996997
```

```
1            200  0.119875  1729   95.914953
1            200  0.119875  1739  103.422116
1            200  0.119875  1749  116.488680
1            200  0.119875  1759  104.218442
2            400  0.119875  1719  234.523351
2            400  0.119875  1729  198.288683
2            400  0.119875  1739  199.450326
2            400  0.119875  1749  197.424721
2            400  0.119875  1759  194.443512

*** Running simulation for nparticles=800 (3 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1717)...
Range of particle indices to simulate with start state #1 out of 6: [0, 67] (n=68, n/N=0.085, p=0.103393, diff=-0.2%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [68, 226] (n=159, n/N=0.19875, p=0.193861, diff=0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [227, 290] (n=64, n/N=0.08, p=0.090468, diff=-0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [291, 573] (n=283, n/N=0.35375, p=0.363489, diff=-0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [574, 733] (n=160, n/N=0.2, p=0.169628, diff=0.2%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [734, 799] (n=66, n/N=0.0825, p=0.079160, diff=0.0%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=57142.9 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 1764 out of N=800
execution time: 5.8 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #1 out of 3: [0, 198] (n=199, n/N=0.24875, p=0.266667, diff=-0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [199, 586] (n=388, n/N=0.485, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [587, 799] (n=213, n/N=0.26625, p=0.233333, diff=0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 239.2 sec, 4.0 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1719)...
Range of particle indices to simulate with start state #3 out of 6: [0, 0] (n=1, n/N=1.0, p=0.090468, diff=10.1%, state=[1, 0, 1])
```

```
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=171428.6 or #events=200719)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=8563.183, n=16396
P=0: Blocking time AFTER removal: t=8563.183, n=16396
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 43285 (41.5% of simulation time T=171428.6)
execution time: 226.6 sec, 3.8 min
execution time MC + FV: 466.0 sec, 7.8 min
        P(K) by MC: 12.035460% (simulation time = 171428.6)
        P(K) estimated by FV: 12.715040%, E(T) = 3.4 (simulation time = 71.4)
        True P(K): 11.987462%



        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1727)...
Range of particle indices to simulate with start state #1 out of 6: [0, 85] (n=86, n/N=0.1075, p=0.103393, diff=0.0%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [86, 254] (n=169, n/N=0.21125, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [255, 325] (n=71, n/N=0.08875, p=0.090468, diff=-0.0%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [326, 599] (n=274, n/N=0.3425, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [600, 752] (n=153, n/N=0.19125, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [753, 799] (n=47, n/N=0.05875, p=0.079160, diff=-0.3%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=57142.9 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 1598 out of N=800
execution time: 5.3 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1727)...
Range of particle indices to simulate with start state #1 out of 3: [0, 228] (n=229, n/N=0.28625, p=0.266667, diff=0.1%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [229, 615] (n=387, n/N=0.48375, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [616, 799] (n=184, n/N=0.23, p=0.233333, diff=-0.0%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 224.1 sec, 3.7 min
        --> Running Monte-Carlo estimation...
```

```
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1729)...
Range of particle indices to simulate with start state #2 out of 6: [0, 0] (n=1, n/N=1.0, p=0.193861, diff=4.2%, state=[1, 1, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=171428.6 or #events=201319)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=8820.789, n=16739
P=0: Blocking time AFTER removal: t=8820.789, n=16739
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 43353 (41.7% of simulation time T=171428.6)
execution time: 220.1 sec, 3.7 min
execution time MC + FV: 444.6 sec, 7.4 min
        P(K) by MC: 12.329450% (simulation time = 171428.6)
        P(K) estimated by FV: 12.198441%, E(T) = 3.4 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 3 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1737)...
Range of particle indices to simulate with start state #1 out of 6: [0, 71] (n=72, n/N=0.09, p=0.103393, diff=-0.1%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [72, 233] (n=162, n/N=0.2025, p=0.193861, diff=0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [234, 309] (n=76, n/N=0.095, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [310, 603] (n=294, n/N=0.3675, p=0.363489, diff=0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [604, 748] (n=145, n/N=0.18125, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [749, 799] (n=51, n/N=0.06375, p=0.079160, diff=-0.2%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=57142.9 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 1670 out of N=800
execution time: 5.3 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1737)...
Range of particle indices to simulate with start state #1 out of 3: [0, 202] (n=203, n/N=0.25375, p=0.266667, diff=-0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [203, 623] (n=421, n/N=0.52625, p=0.500000, diff=0.1%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [624, 799] (n=176, n/N=0.22, p=0.233333, diff=-0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
```

```
execution time: 227.1 sec, 3.8 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1739)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=171428.6 or #events=198610)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=8215.224, n=15734
P=0: [<EventType.BLOCK: 9>] events at time 70372.0 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 70372.2 removed.
P=0: [<EventType.BLOCK: 9>] events at time 70374.1 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 70374.9 removed.
P=0: [<EventType.BLOCK: 9>] events at time 70375.9 removed.
P=0: [<EventType.UNBLOCK: -9>] events at time 70376.1 removed.
P=0: Blocking time AFTER removal: t=8213.972, n=15731
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 43566 (41.1% of simulation time T=171428.6)
execution time: 221.6 sec, 3.7 min
execution time MC + FV: 449.1 sec, 7.5 min
        P(K) by MC: 11.672309% (simulation time = 171428.6)
        P(K) estimated by FV: 11.273355%, E(T) = 3.0 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 4 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1747)...
Range of particle indices to simulate with start state #1 out of 6: [0, 78] (n=79, n/N=0.09875, p=0.103393, diff=-0.0%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [79, 245] (n=167, n/N=0.20875, p=0.193861, diff=0.1%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [246, 327] (n=82, n/N=0.1025, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [328, 618] (n=291, n/N=0.36375, p=0.363489, diff=0.0%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [619, 738] (n=120, n/N=0.15, p=0.169628, diff=-0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [739, 799] (n=61, n/N=0.07625, p=0.079160, diff=-0.0%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=57142.9 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 1673 out of N=800
execution time: 5.1 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1747)...
Range of particle indices to simulate with start state #1 out of 3: [0, 212] (n=213, n/N=0.26625, p=0.266667, diff=-0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [213, 623] (n=411, n/N=0.51375, p=0.500000, diff=0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [624, 799] (n=176, n/N=0.22, p=0.233333, diff=-0.1%, state=[0, 0, 1])
```

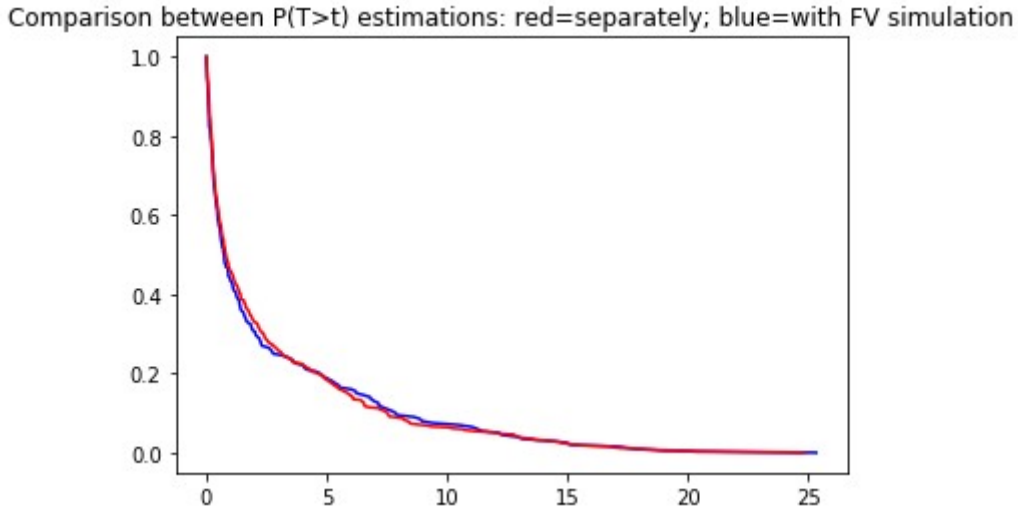
```
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 228.7 sec, 3.8 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1749)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=171428.6 or #events=199398)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=8549.322, n=16292
P=0: [<EventType.ABSORPTION: 0>] events at time 70893.6 removed.
P=0: Blocking time AFTER removal: t=8549.322, n=16292
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 43343 (41.4% of simulation time T=171428.6)
execution time: 222.3 sec, 3.7 min
execution time MC + FV: 451.3 sec, 7.5 min
        P(K) by MC: 12.059364% (simulation time = 171428.6)
        P(K) estimated by FV: 11.282554%, E(T) = 3.1 (simulation time = 71.4)
        True P(K): 11.987462%




        Replication 5 of 5...

        --> Running Fleming-Viot estimation...
        Step AUXILIARY (for comparison purposes only): Simulating using an ACTIVATION start state to estimate P(T>t / s=act), the survival probability given
activation (seed=1757)...
Range of particle indices to simulate with start state #1 out of 6: [0, 85] (n=86, n/N=0.1075, p=0.103393, diff=0.0%, state=[2, 0, 0])
Range of particle indices to simulate with start state #2 out of 6: [86, 238] (n=153, n/N=0.19125, p=0.193861, diff=-0.0%, state=[1, 1, 0])
Range of particle indices to simulate with start state #3 out of 6: [239, 319] (n=81, n/N=0.10125, p=0.090468, diff=0.1%, state=[1, 0, 1])
Range of particle indices to simulate with start state #4 out of 6: [320, 592] (n=273, n/N=0.34125, p=0.363489, diff=-0.1%, state=[0, 2, 0])
Range of particle indices to simulate with start state #5 out of 6: [593, 737] (n=145, n/N=0.18125, p=0.169628, diff=0.1%, state=[0, 1, 1])
Range of particle indices to simulate with start state #6 out of 6: [738, 799] (n=62, n/N=0.0775, p=0.079160, diff=-0.0%, state=[0, 0, 2])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=57142.9 or #events=inf)...
Finalizing and identifying measurement times...
        --> Number of observations for P(T>t) estimation: 1634 out of N=800
execution time: 5.0 sec, 0.1 min
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1757)...
```

```
Range of particle indices to simulate with start state #1 out of 3: [0, 213] (n=214, n/N=0.2675, p=0.266667, diff=0.0%, state=[1, 0, 0])
Range of particle indices to simulate with start state #2 out of 3: [214, 602] (n=389, n/N=0.48625, p=0.500000, diff=-0.0%, state=[0, 1, 0])
Range of particle indices to simulate with start state #3 out of 3: [603, 799] (n=197, n/N=0.24625, p=0.233333, diff=0.1%, state=[0, 0, 1])
simulate: [reactivate=True] Generating trajectories for each particle until the first ACTIVATION after the burn-in period takes place...
--> so that we can start the FV procedure.
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=71.4 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 243.4 sec, 4.1 min
        --> Running Monte-Carlo estimation...
        Step 1 of 1: Estimating the blocking probability by Monte-Carlo (seed=1759)...
Range of particle indices to simulate with start state #4 out of 6: [0, 0] (n=1, n/N=1.0, p=0.363489, diff=1.8%, state=[0, 2, 0])
simulate: Generating trajectories for each particle until first absorption...
--> so that we can sort ALL the first absorption times of particles and start reactivating when reactivate=True.
Generating trajectories for each particle until END OF SIMULATION (T=171428.6 or #events=199887)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=8569.582, n=16090
P=0: Blocking time AFTER removal: t=8569.582, n=16090
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 43737 (41.4% of simulation time T=171428.6)
execution time: 225.6 sec, 3.8 min
execution time MC + FV: 469.4 sec, 7.8 min
        P(K) by MC: 12.063506% (simulation time = 171428.6)
        P(K) estimated by FV: 12.671789%, E(T) = 3.3 (simulation time = 71.4)
        True P(K): 11.987462%
Results:
   K BSA    N replication    Pr(MC)      Time(MC) # Events(MC) # Cycles(MC)  \
1  5   2  200           1  0.119579  17799.464175        50087        10926
1  5   2  200           2  0.125063  17771.701088        49912        10739
1  5   2  200           3  0.120234  17769.369134        50063        10846
1  5   2  200           4  0.119176  17717.673329        49807        10827
1  5   2  200           5  0.122321  17671.011406        49713        10913
2  5   2  400           1  0.120887  35396.303972        99787        21701
2  5   2  400           2  0.123199  35960.900309       101115        21695
2  5   2  400           3  0.118085  35567.480320       100176        21911
2  5   2  400           4  0.119950  35058.216146        98874        21573
2  5   2  400           5  0.123275  35279.498311        99597        21752
3  5   2  800           1  0.120355  71149.609329       200719        43285
3  5   2  800           2  0.123294  71542.439405       201319        43353
3  5   2  800           3  0.116723  70371.439696       198610        43566
3  5   2  800           4  0.120594  70893.639685       199398        43343
3  5   2  800           5  0.120635  71037.243891       199887        43737

       E(T) # Cycles(E(T))    Pr(FV)      Time(FV) # Events(FV)  \
1  3.936576            200  0.128355  14285.714286        50087
```

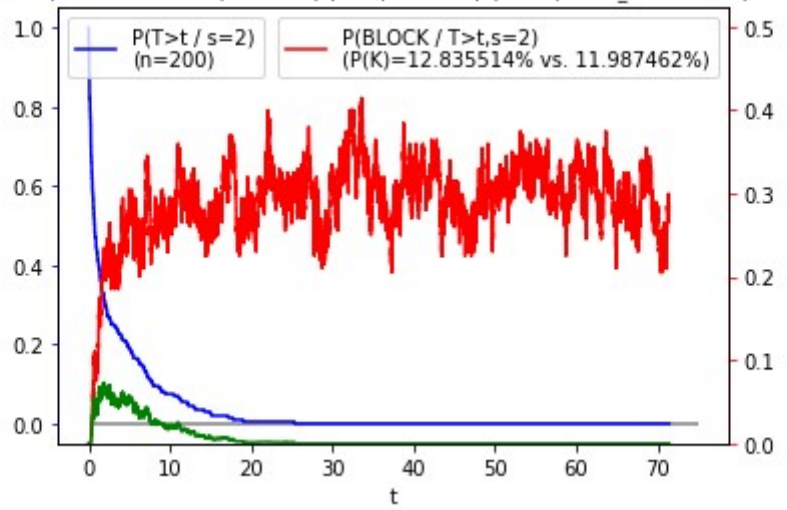
```
1  2.966620            200  0.111319  14285.714286        49912
1  3.317763            200  0.119001  14285.714286        50063
1  3.347408            200  0.130623  14285.714286        49807
1  3.108353            200  0.128997  14285.714286        49713
2  3.327745            400  0.128387  28571.428571        99787
2  3.252857            400  0.119231  28571.428571       101115
2  3.537154            400  0.119902  28571.428571       100176
2  3.034370            400  0.113464  28571.428571        98874
2  3.364890            400  0.132890  28571.428571        99597
3  3.369856            800  0.127150  57142.857143       200719
3  3.354118            800  0.121984  57142.857143       201319
3  3.040997            800  0.112734  57142.857143       198610
3  3.118483            800  0.112826  57142.857143       199398
3  3.323658            800  0.126718  57142.857143       199887

  # Samples Surv     Pr(K)  seed   exec_time
1            200  0.119875  1719  105.996997
1            200  0.119875  1729   95.914953
1            200  0.119875  1739  103.422116
1            200  0.119875  1749  116.488680
1            200  0.119875  1759  104.218442
2            400  0.119875  1719  234.523351
2            400  0.119875  1729  198.288683
2            400  0.119875  1739  199.450326
2            400  0.119875  1749  197.424721
2            400  0.119875  1759  194.443512
3            800  0.119875  1719  465.956217
3            800  0.119875  1729  444.601375
3            800  0.119875  1739  449.096864
3            800  0.119875  1749  451.330752
3            800  0.119875  1759  469.436358
Total execution time: 63.8 min
Simulation results for #servers=3, K=5, rhos=[0.4, 0.75, 0.35], (200<=N<=800), T<=71, Rep=5
Raw results by N:
   K BSA    N replication    Pr(MC)      Time(MC) # Events(MC) # Cycles(MC)  \
1  5   2  200           1  0.119579  17799.464175        50087        10926
1  5   2  200           2  0.125063  17771.701088        49912        10739
1  5   2  200           3  0.120234  17769.369134        50063        10846
1  5   2  200           4  0.119176  17717.673329        49807        10827
1  5   2  200           5  0.122321  17671.011406        49713        10913
2  5   2  400           1  0.120887  35396.303972        99787        21701
2  5   2  400           2  0.123199  35960.900309       101115        21695
2  5   2  400           3  0.118085  35567.480320       100176        21911
2  5   2  400           4  0.119950  35058.216146        98874        21573
2  5   2  400           5  0.123275  35279.498311        99597        21752
3  5   2  800           1  0.120355  71149.609329       200719        43285
3  5   2  800           2  0.123294  71542.439405       201319        43353
3  5   2  800           3  0.116723  70371.439696       198610        43566
```

```
3  5   2  800           4  0.120594  70893.639685       199398        43343
3  5   2  800           5  0.120635  71037.243891       199887        43737

       E(T) # Cycles(E(T))    Pr(FV)      Time(FV) # Events(FV)  \
1  3.936576            200  0.128355  14285.714286        50087
1  2.966620            200  0.111319  14285.714286        49912
1  3.317763            200  0.119001  14285.714286        50063
1  3.347408            200  0.130623  14285.714286        49807
1  3.108353            200  0.128997  14285.714286        49713
2  3.327745            400  0.128387  28571.428571        99787
2  3.252857            400  0.119231  28571.428571       101115
2  3.537154            400  0.119902  28571.428571       100176
2  3.034370            400  0.113464  28571.428571        98874
2  3.364890            400  0.132890  28571.428571        99597
3  3.369856            800  0.127150  57142.857143       200719
3  3.354118            800  0.121984  57142.857143       201319
3  3.040997            800  0.112734  57142.857143       198610
3  3.118483            800  0.112826  57142.857143       199398
3  3.323658            800  0.126718  57142.857143       199887

  # Samples Surv     Pr(K)  seed   exec_time
1            200  0.119875  1719  105.996997
1            200  0.119875  1729   95.914953
1            200  0.119875  1739  103.422116
1            200  0.119875  1749  116.488680
1            200  0.119875  1759  104.218442
2            400  0.119875  1719  234.523351
2            400  0.119875  1729  198.288683
2            400  0.119875  1739  199.450326
2            400  0.119875  1749  197.424721
2            400  0.119875  1759  194.443512
3            800  0.119875  1719  465.956217
3            800  0.119875  1729  444.601375
3            800  0.119875  1739  449.096864
3            800  0.119875  1749  451.330752
3            800  0.119875  1759  469.436358
Aggregated results by N:
    # Events(MC)                                                    \
           count      mean          std       min       max          SE
N
200            5   49916.4   161.210421   49713.0   50087.0   72.095492
400            5   99909.8   822.978554   98874.0  101115.0  368.047198
800            5  199986.6  1068.070363  198610.0  201319.0  477.655587

    # Cycles(MC)                                ...    # Events(FV)  \
           count     mean         std      min    ...             std
N                                               ...
200            5  10850.2   75.184440  10739.0    ...      161.210421
```

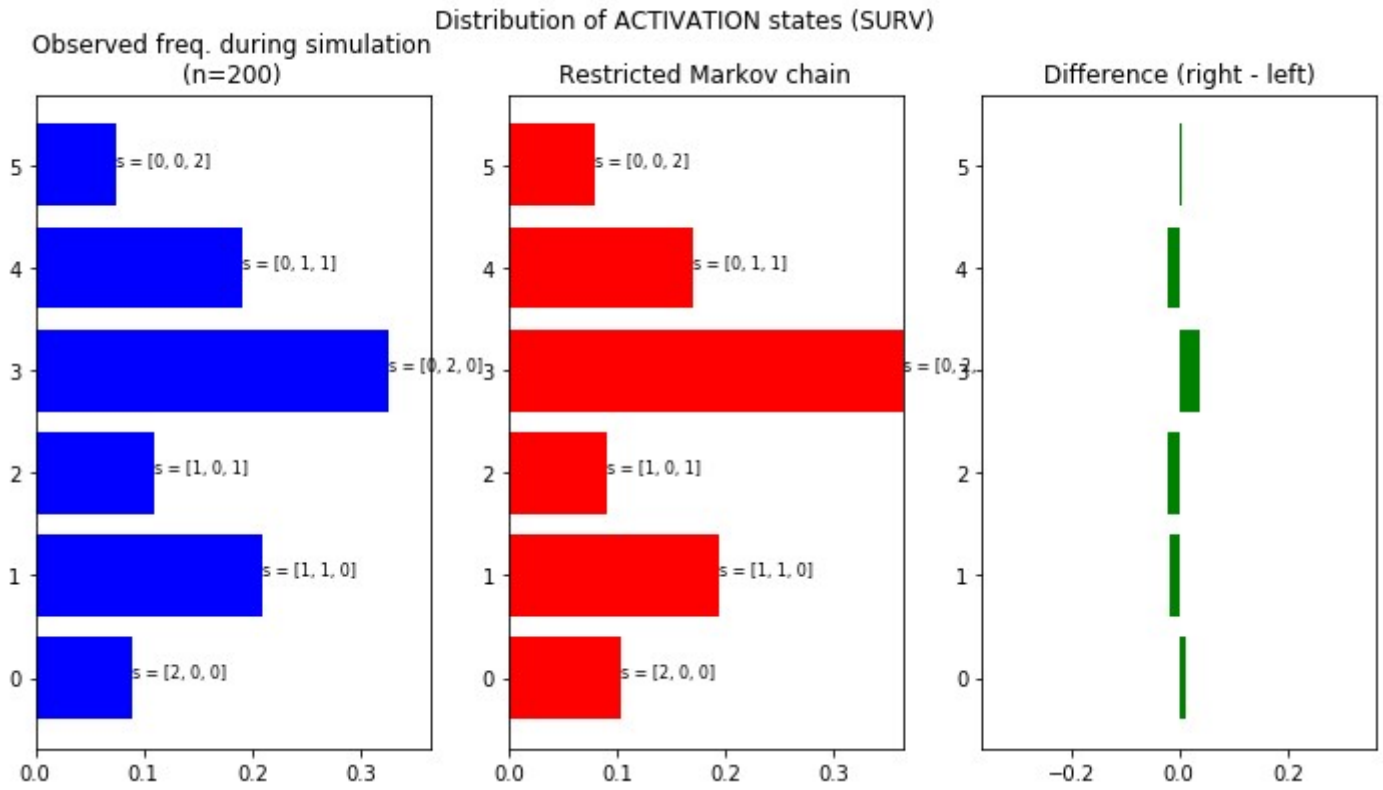
```
400            5  21726.4  122.367479  21573.0    ...      822.978554
800            5  43456.8  189.523613  43285.0    ...     1068.070363

                                  Pr(FV)                                \
          min       max          SE  count      mean       std       min
N
200   49713.0   50087.0   72.095492      5  0.123659  0.008262  0.111319
400   98874.0  101115.0  368.047198      5  0.122775  0.007767  0.113464
800  198610.0  201319.0  477.655587      5  0.120282  0.007143  0.112734


          max        SE
N
200  0.130623  0.003695
400  0.132890  0.003474
800  0.127150  0.003194

[3 rows x 30 columns]
Results of simulation saved to E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\test
Aggregated results of simulation saved to E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\test
```

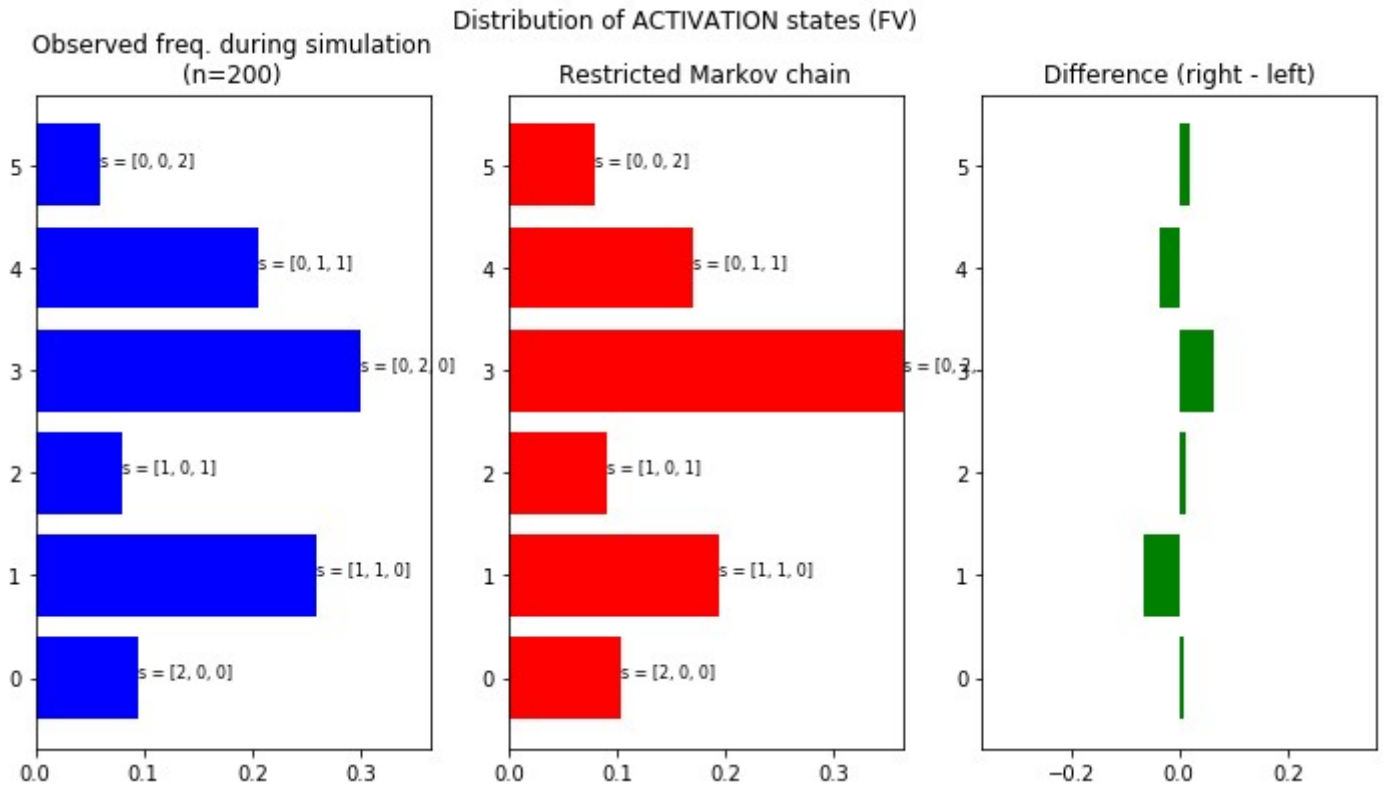


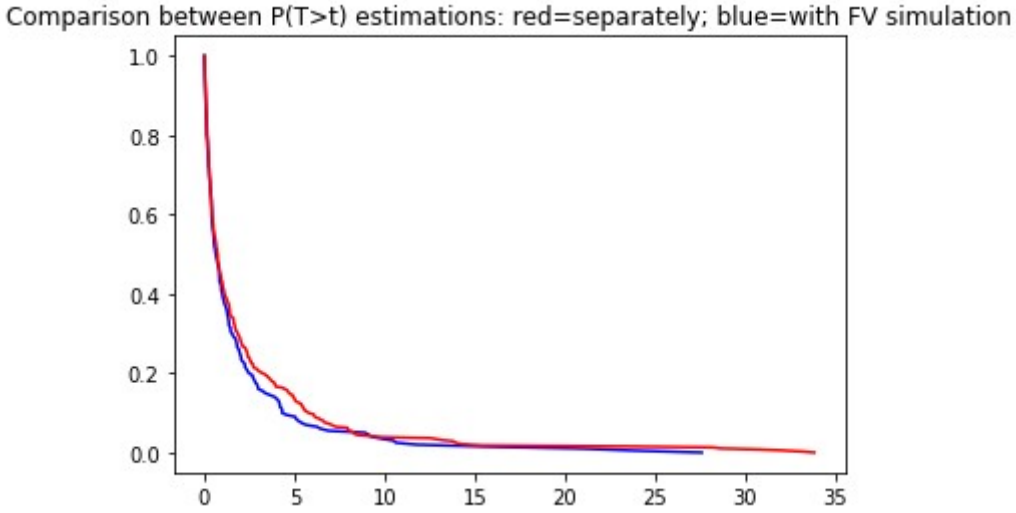
K=5, rhos=[0.4, 0.75, 0.35], N=200, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.9(n=200), finalize=ABS, seed=1717



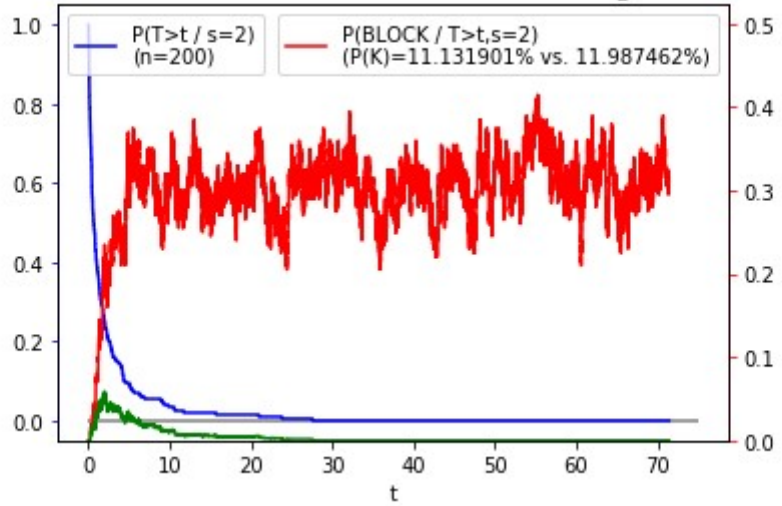
<matplotlib.figure.Figure at 0x1dd6186f400>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

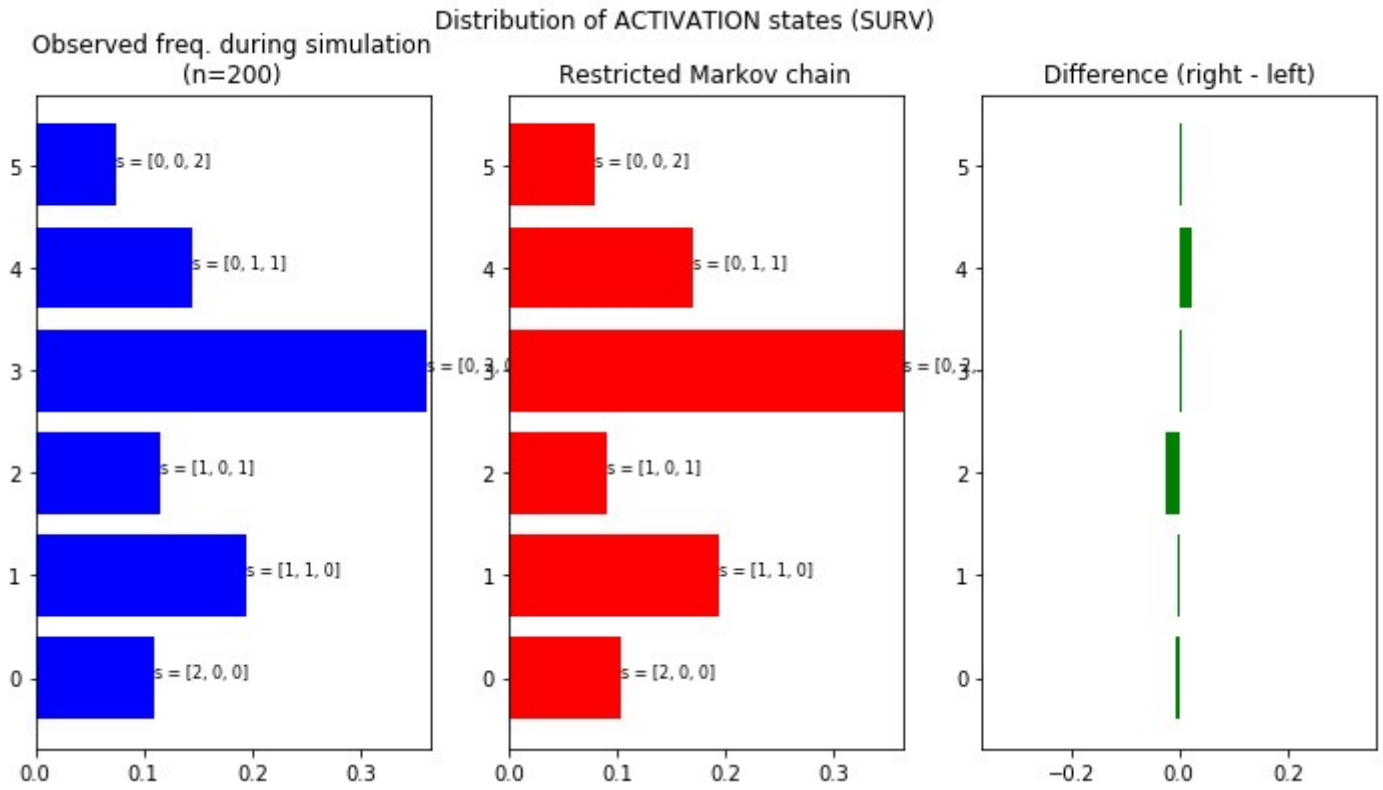

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

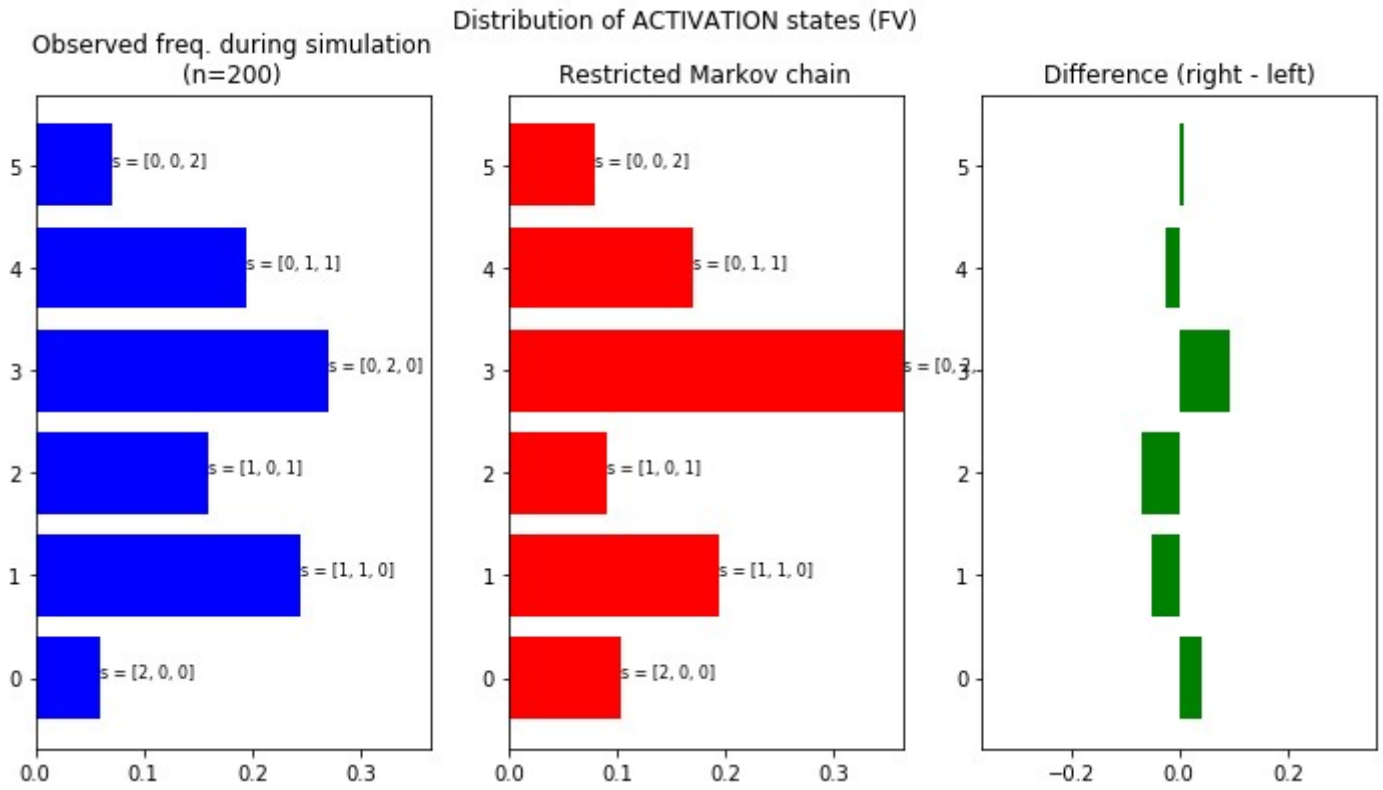


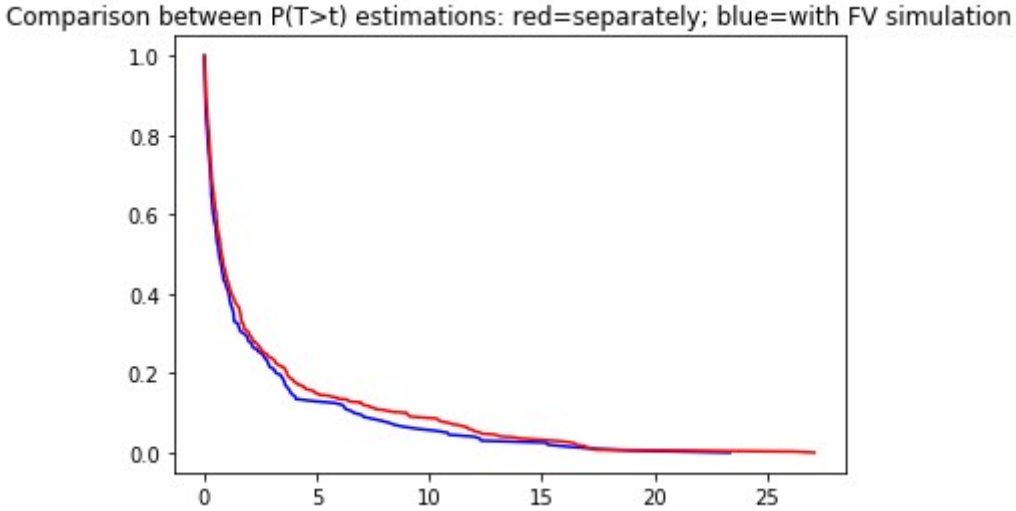
K=5, rhos=[0.4, 0.75, 0.35], N=200, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.0(n=200), finalize=ABS, seed=1727



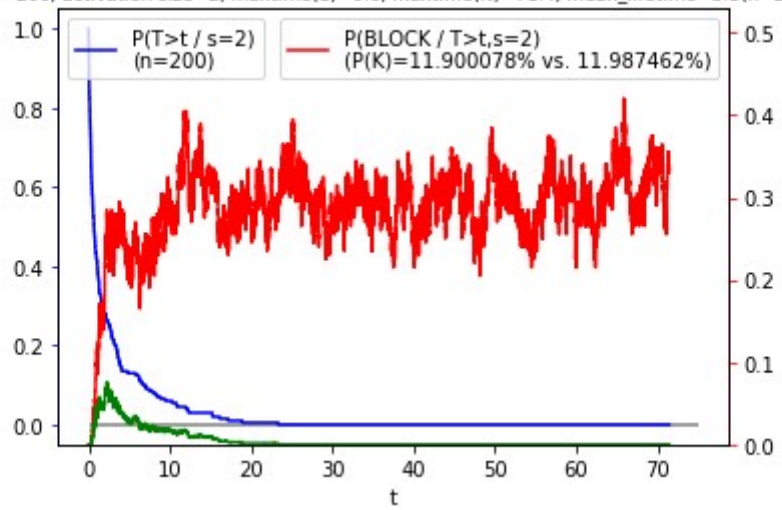
<matplotlib.figure.Figure at 0x1dd63a2f048>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0
1
2
3
4
5
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

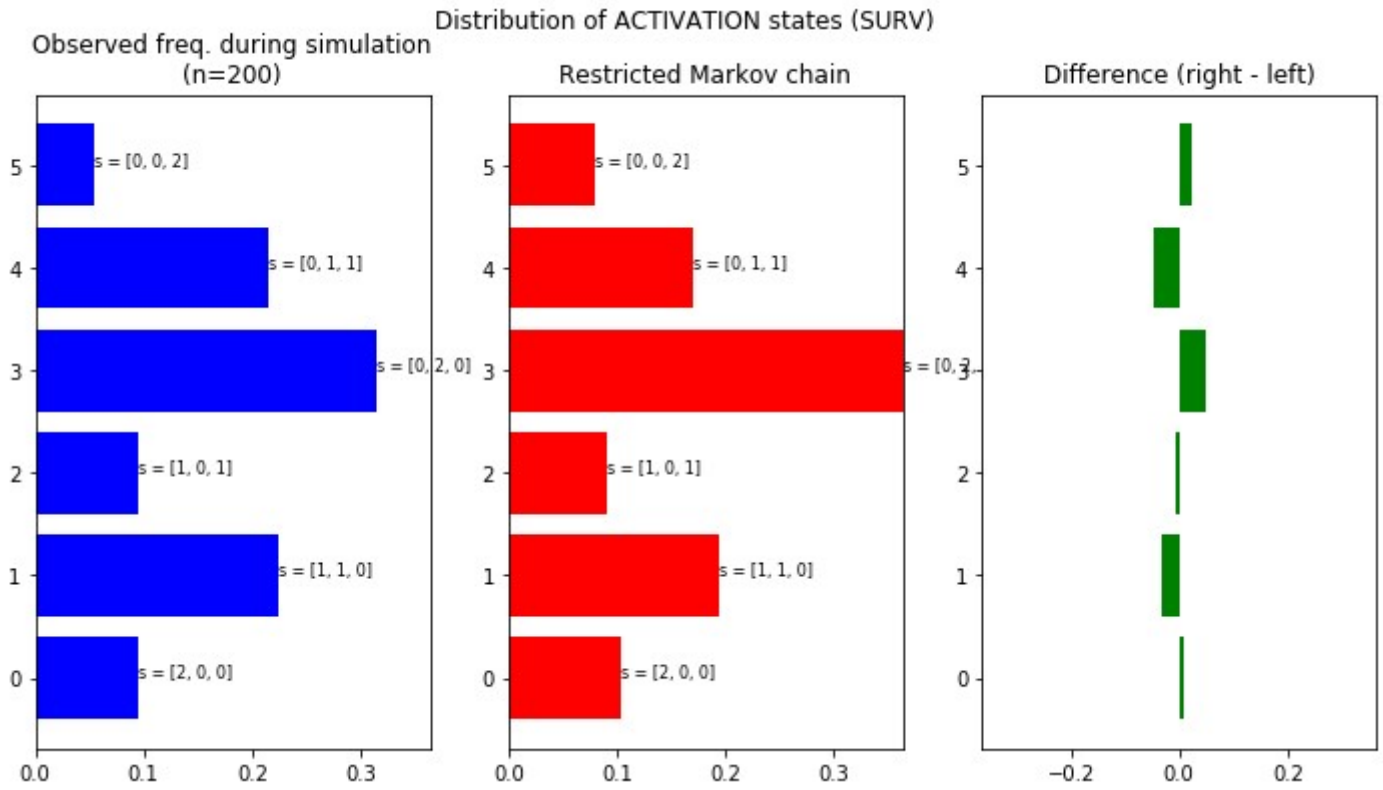

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0
1
2
3
4
5
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

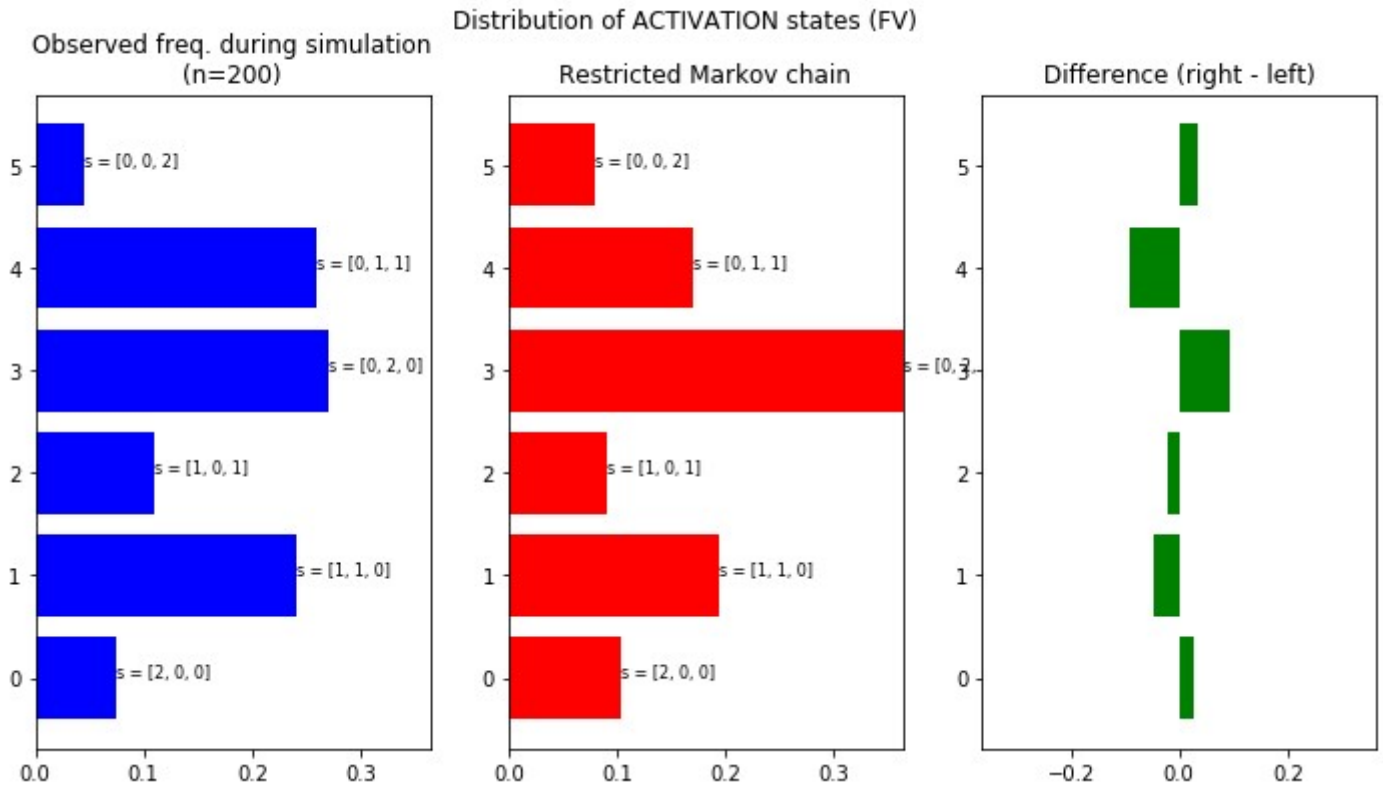


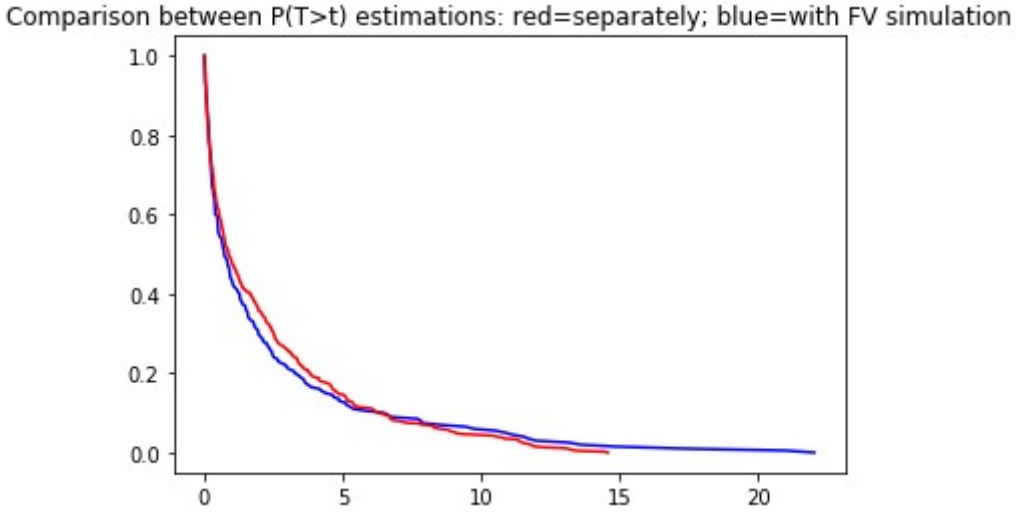
K=5, rhos=[0.4, 0.75, 0.35], N=200, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.3(n=200), finalize=ABS, seed=1737



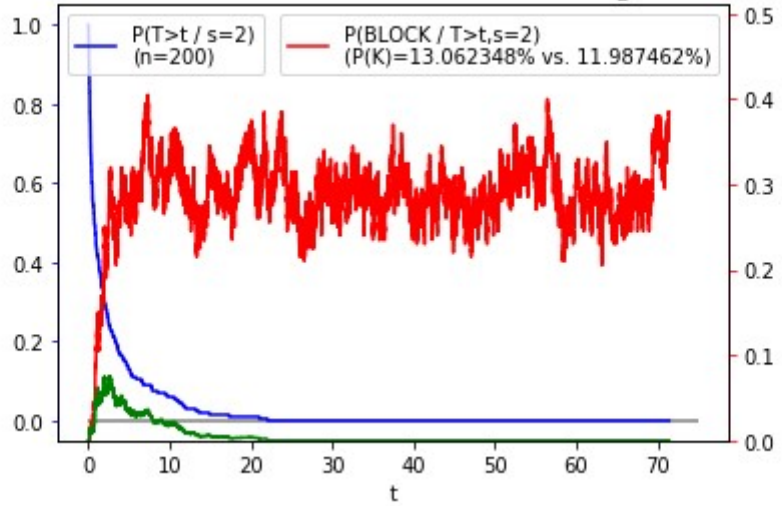
<matplotlib.figure.Figure at 0x1dd64d75630>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

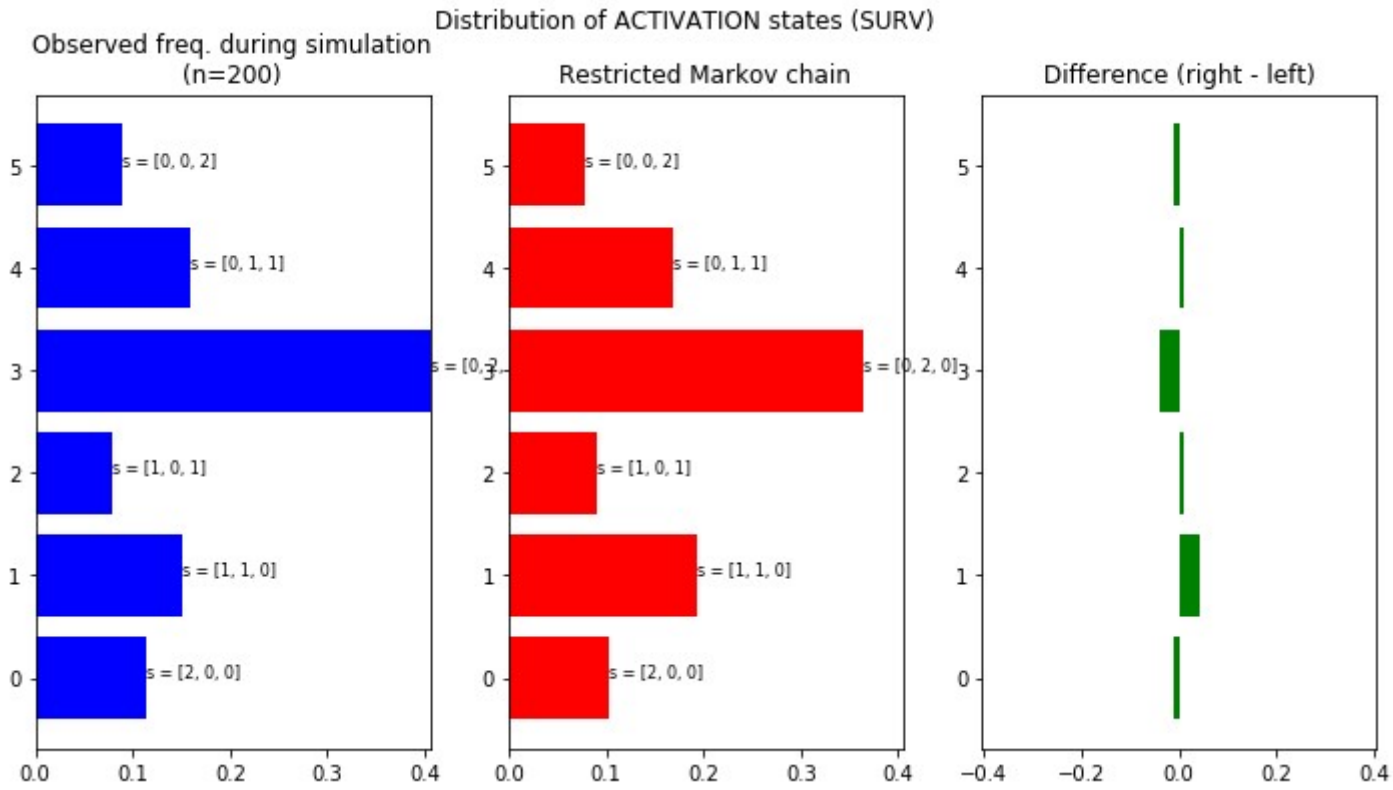

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

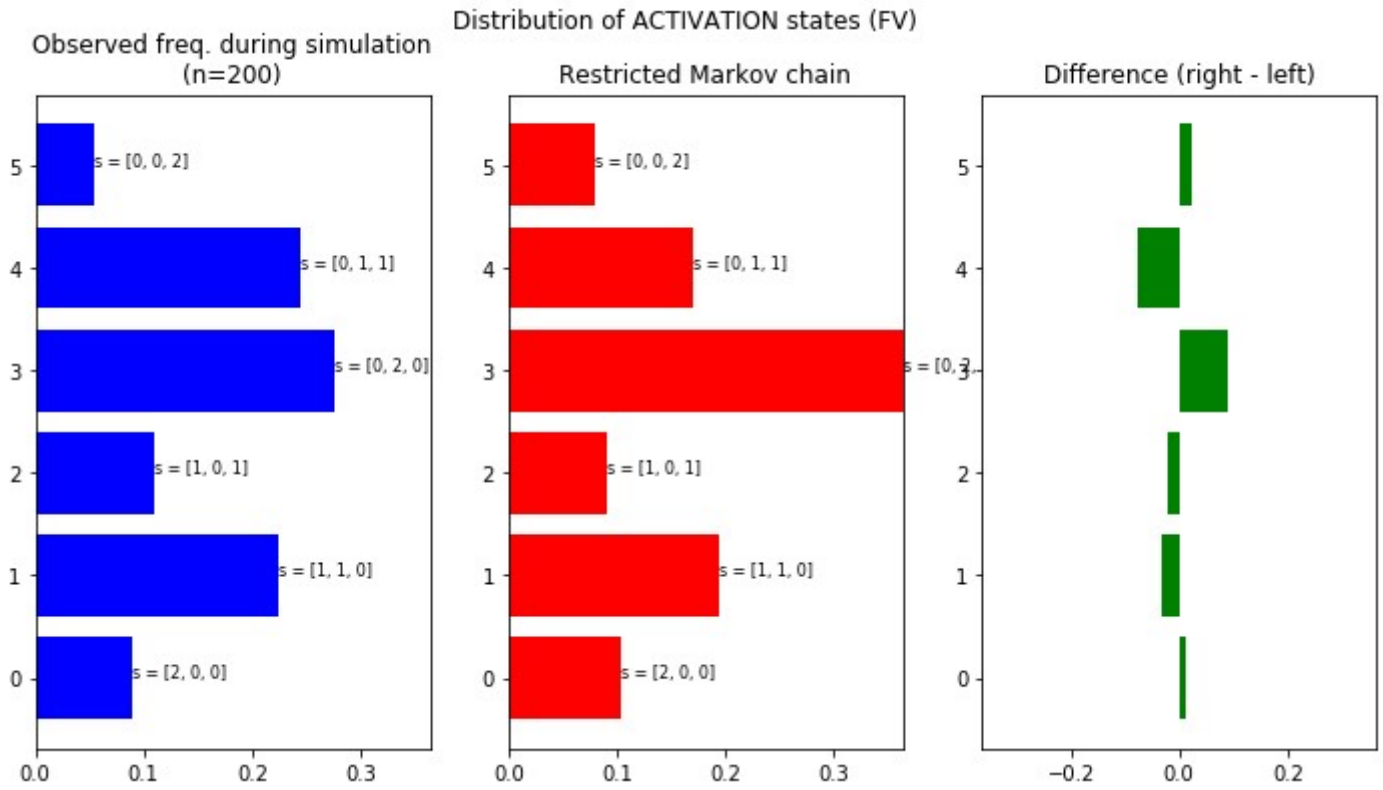


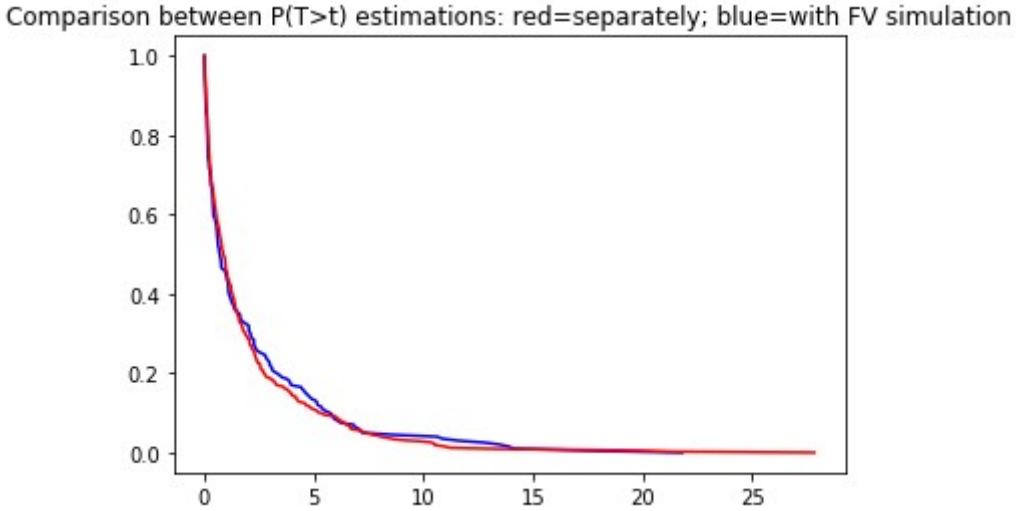
K=5, rhos=[0.4, 0.75, 0.35], N=200, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.3(n=200), finalize=ABS, seed=1747



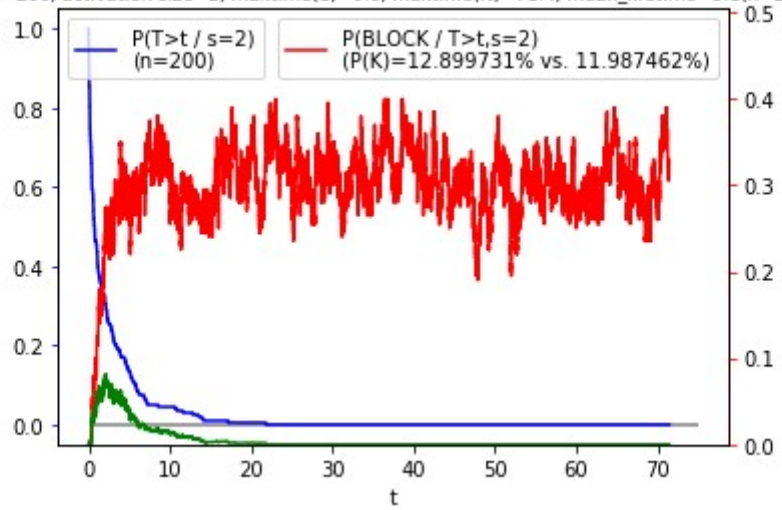
<matplotlib.figure.Figure at 0x1dd6501f198>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0
1
2
3
4
5
0.0
0.1
0.2
0.3
0.4
−0.4
−0.2
0.0
0.2
0.4


Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0
1
2
3
4
5
0.0
0.1
0.2
0.3
−0.2
0.0
0.2



K=5, rhos=[0.4, 0.75, 0.35], N=200, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.1(n=200), finalize=ABS, seed=1757



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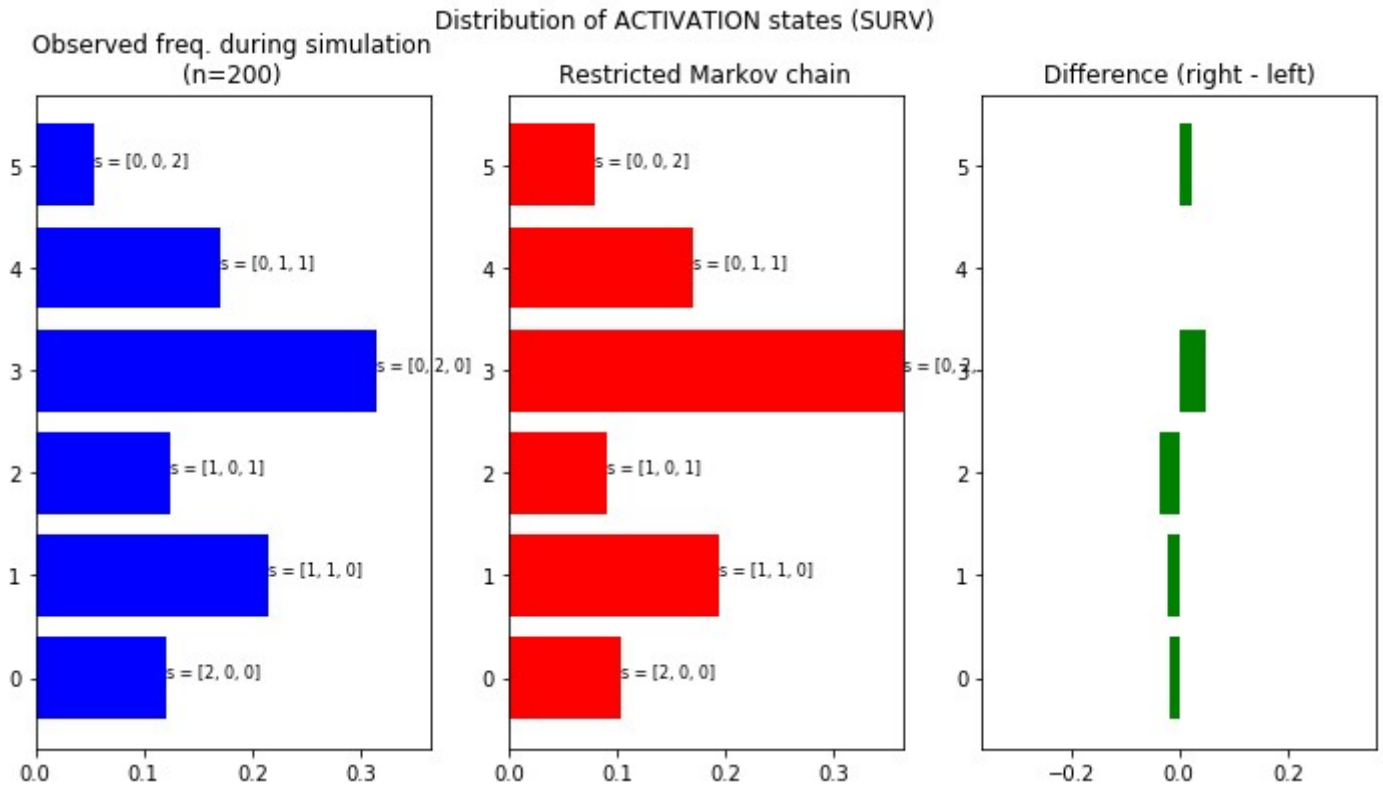
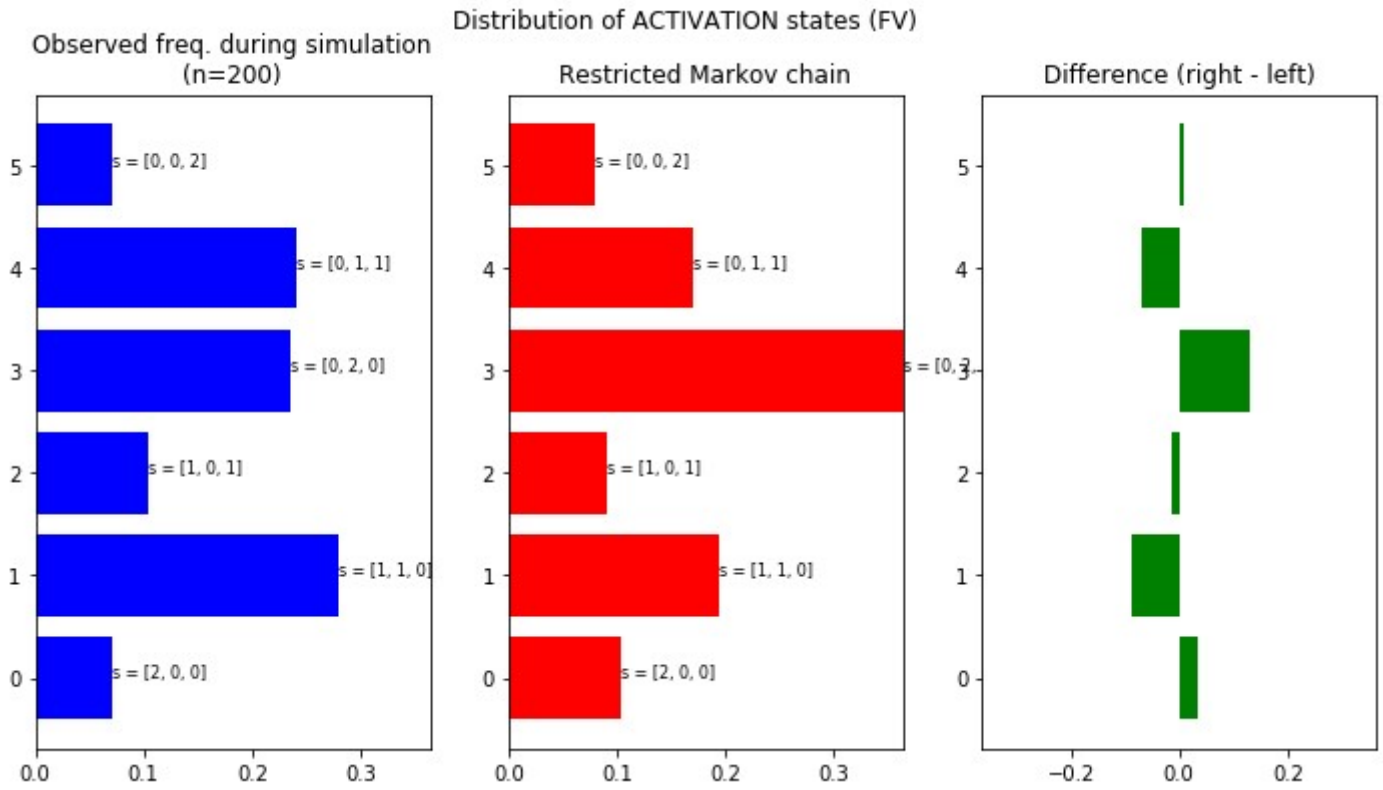
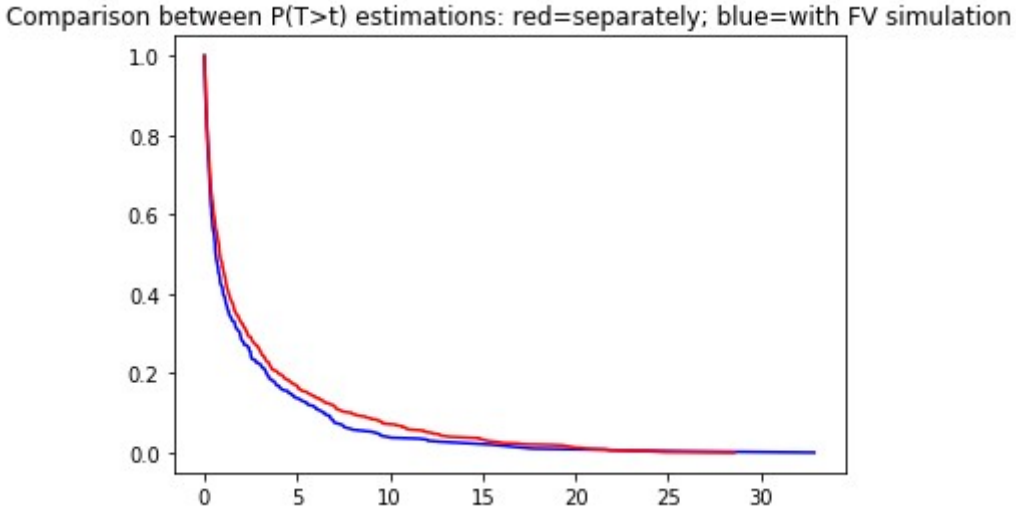
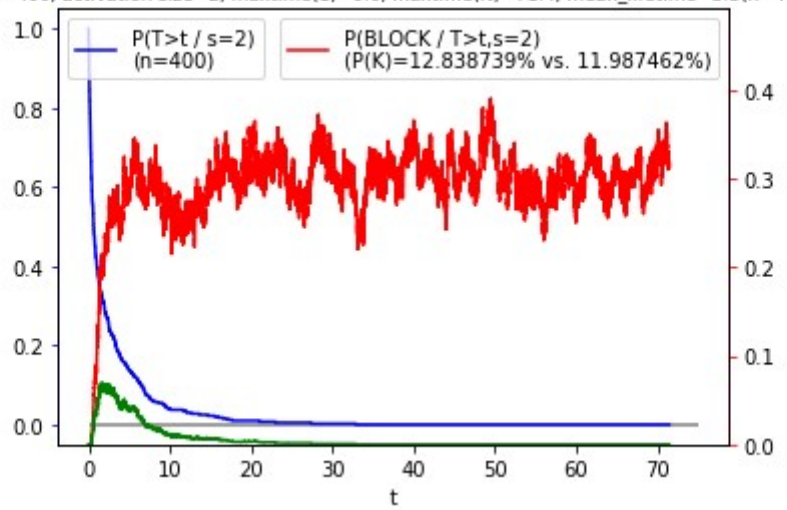

Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2
0
1
2
3
4
5

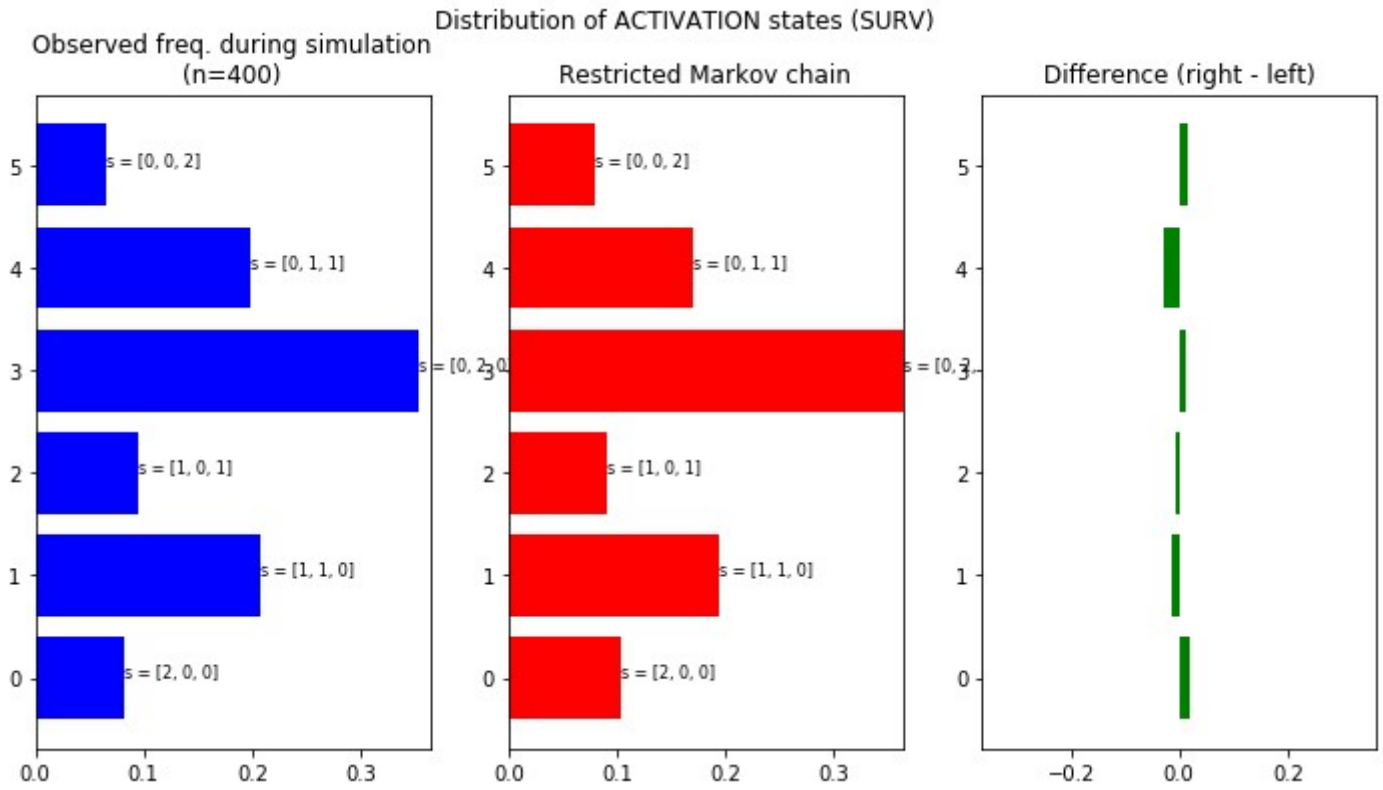

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=200)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

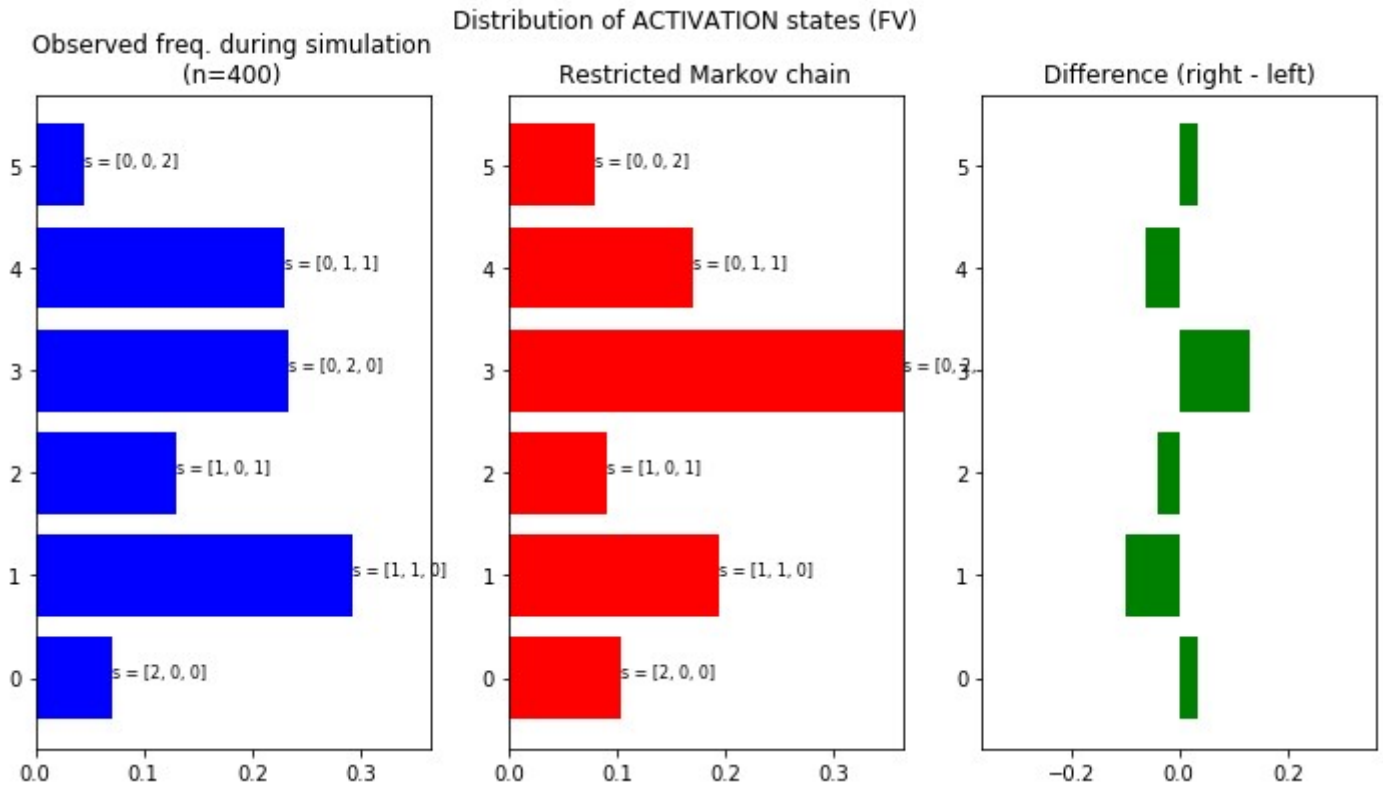


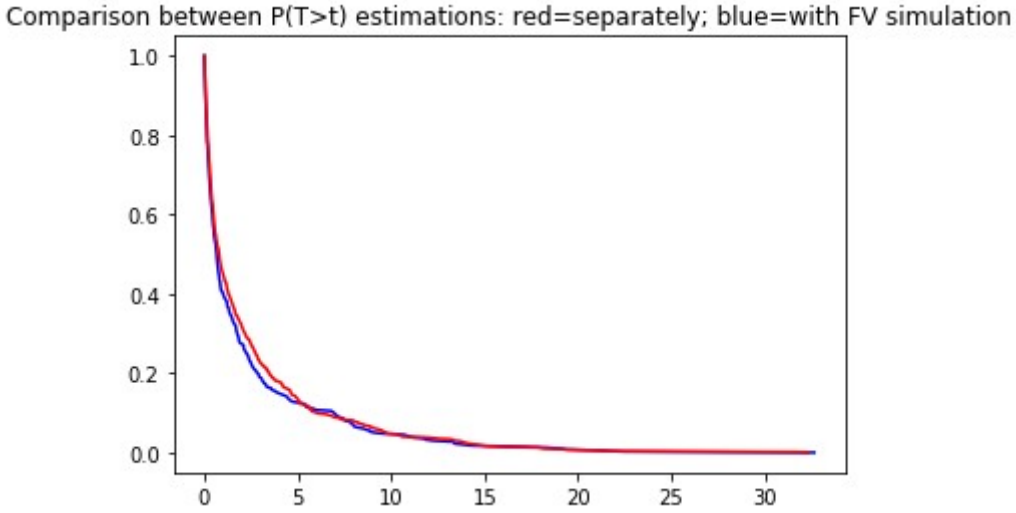
K=5, rhos=[0.4, 0.75, 0.35], N=400, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.3(n=400), finalize=ABS, seed=1717



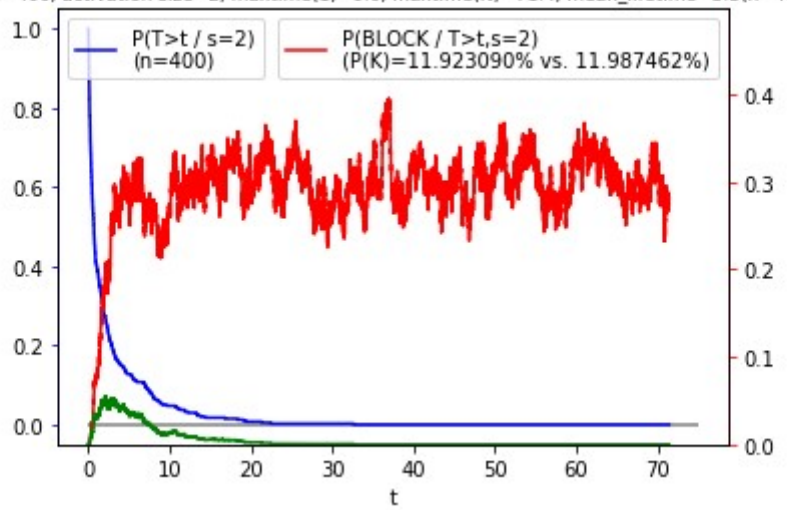
<matplotlib.figure.Figure at 0x1dd677f5080>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

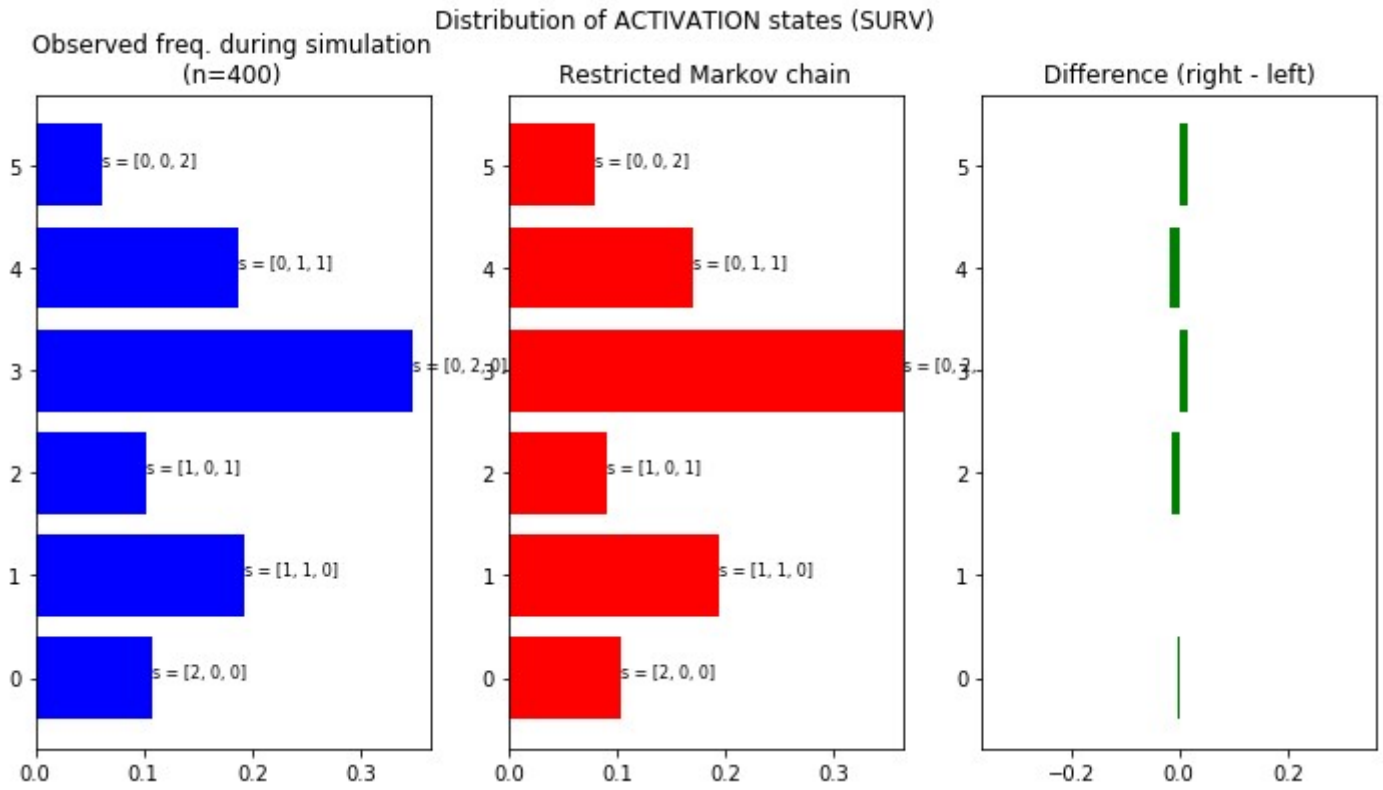

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

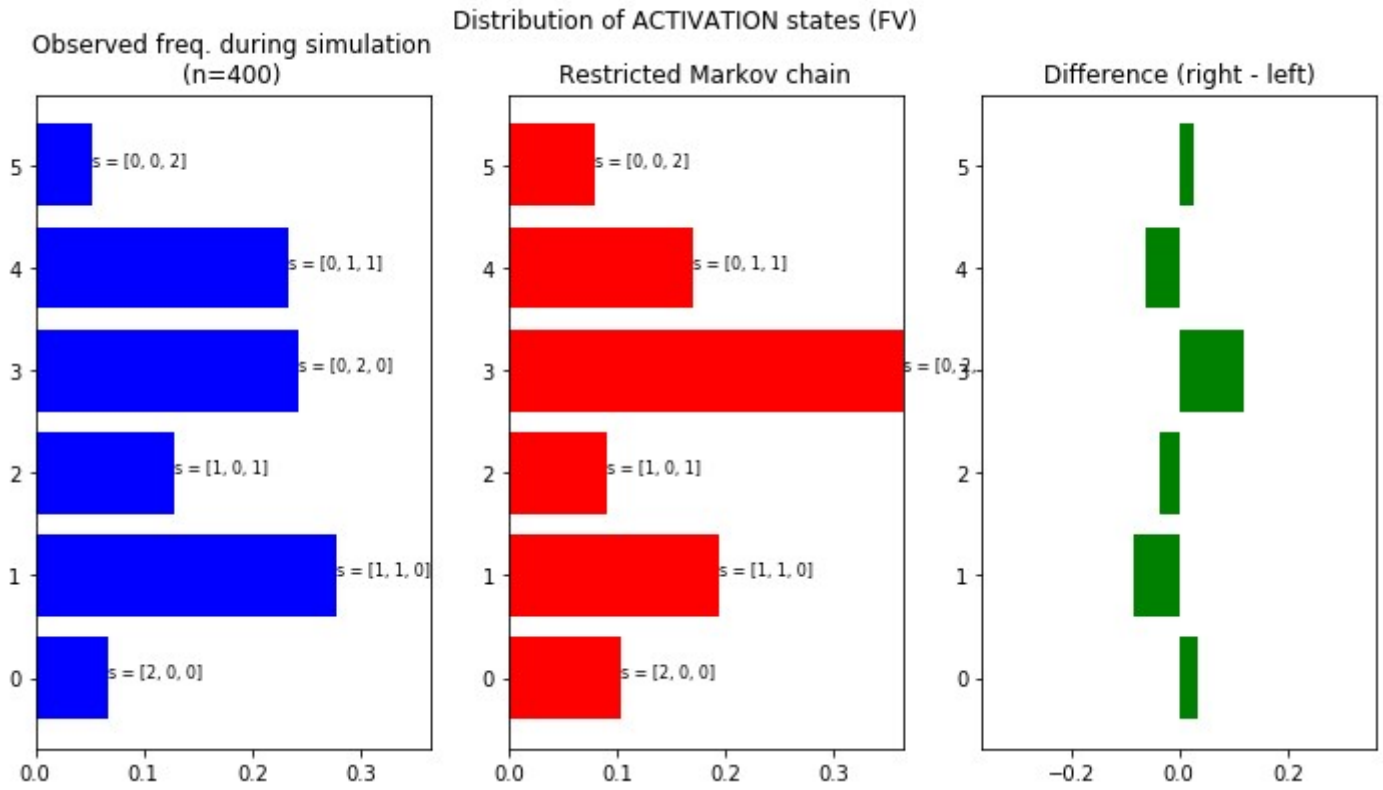


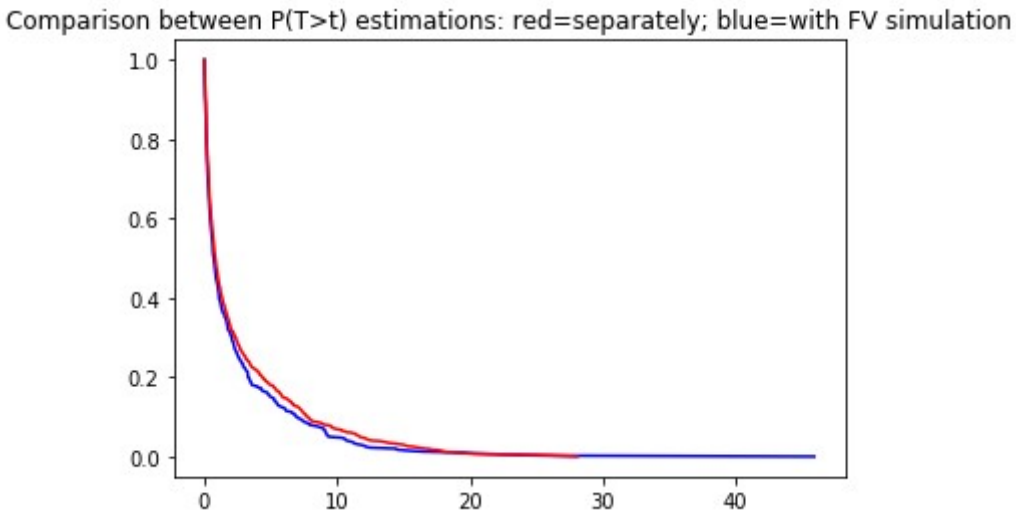
K=5, rhos=[0.4, 0.75, 0.35], N=400, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.3(n=400), finalize=ABS, seed=1727



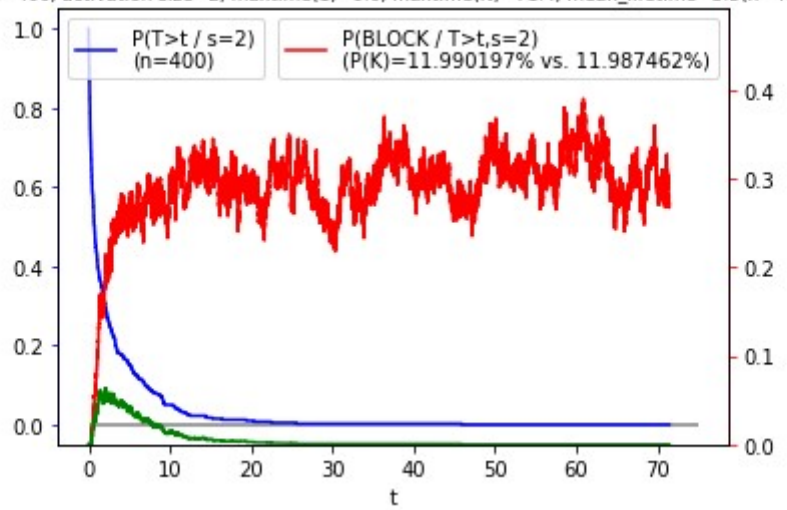
<matplotlib.figure.Figure at 0x1dd6ae1a470>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

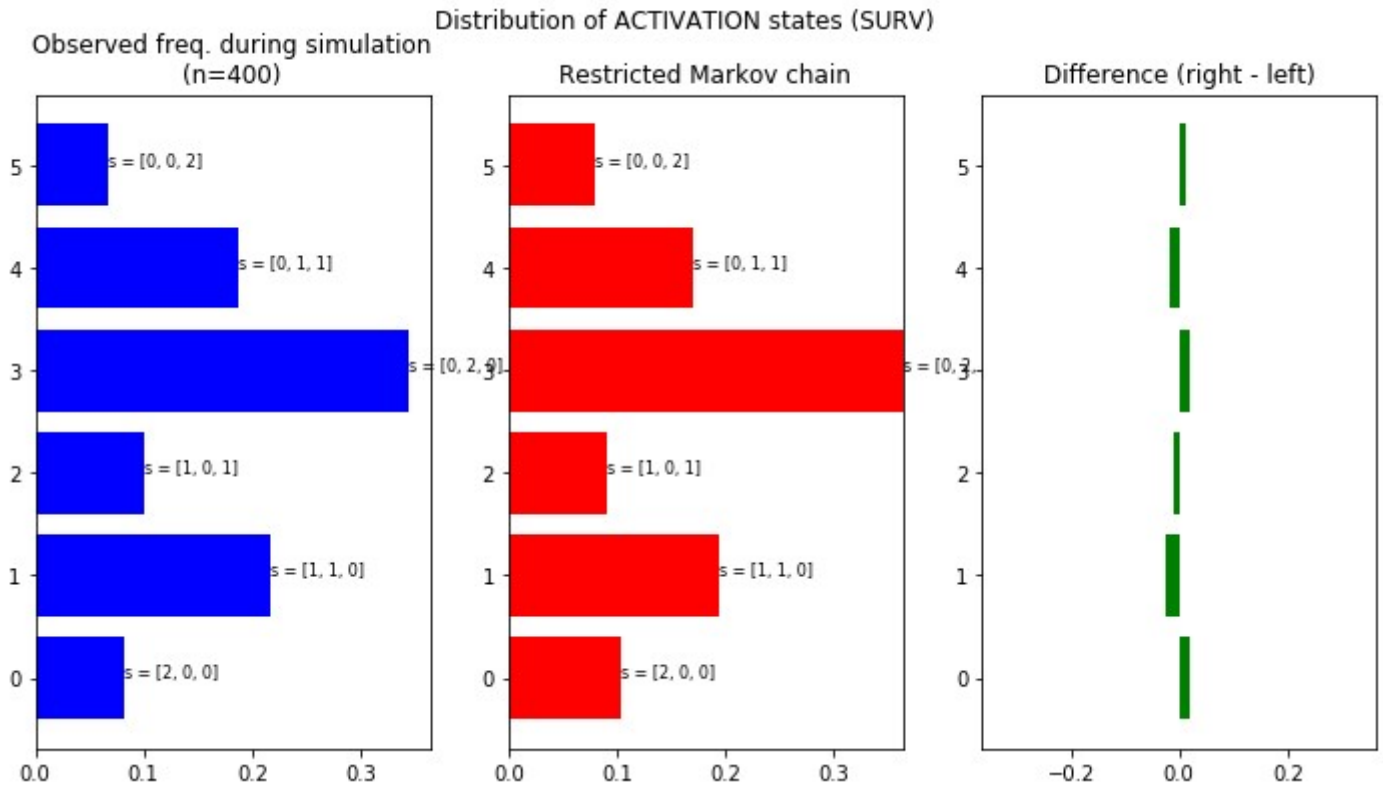

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

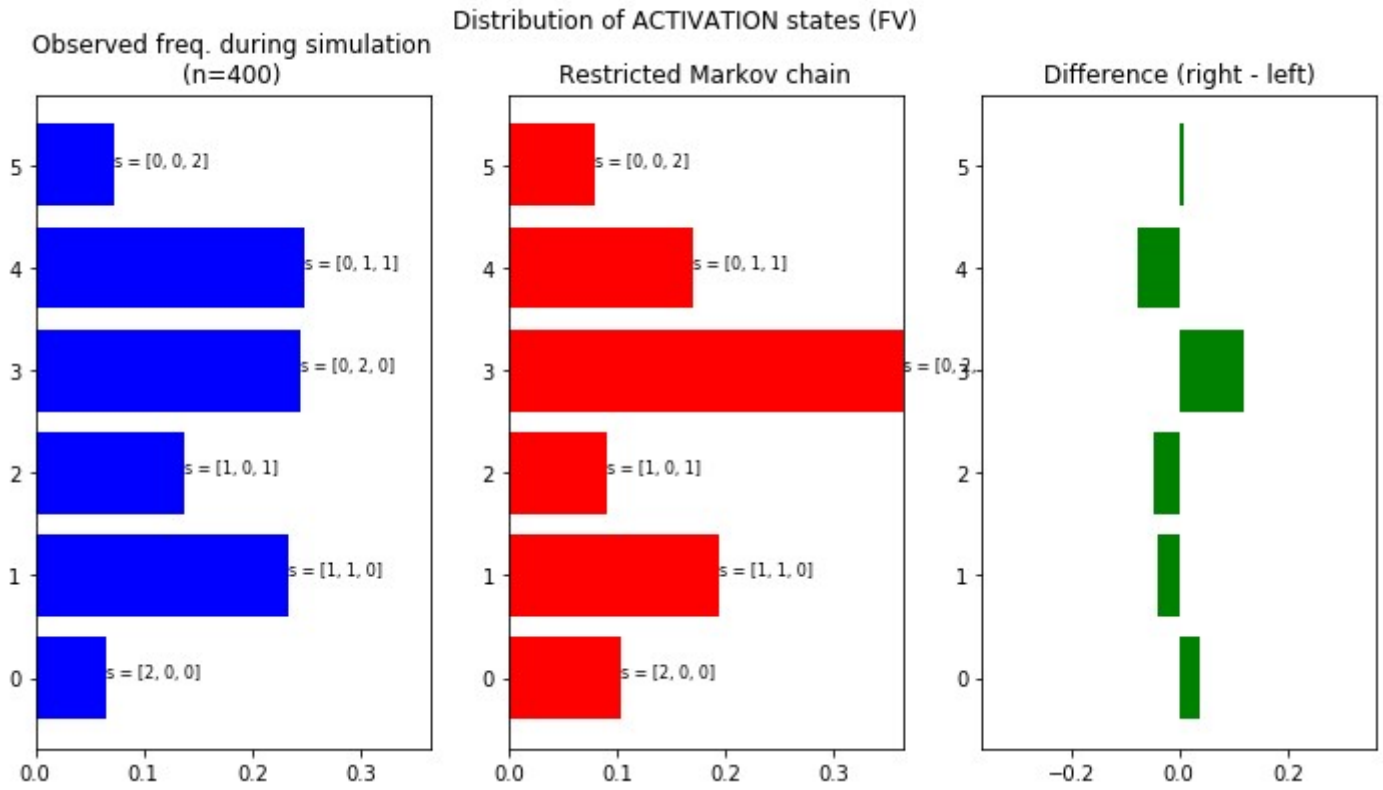


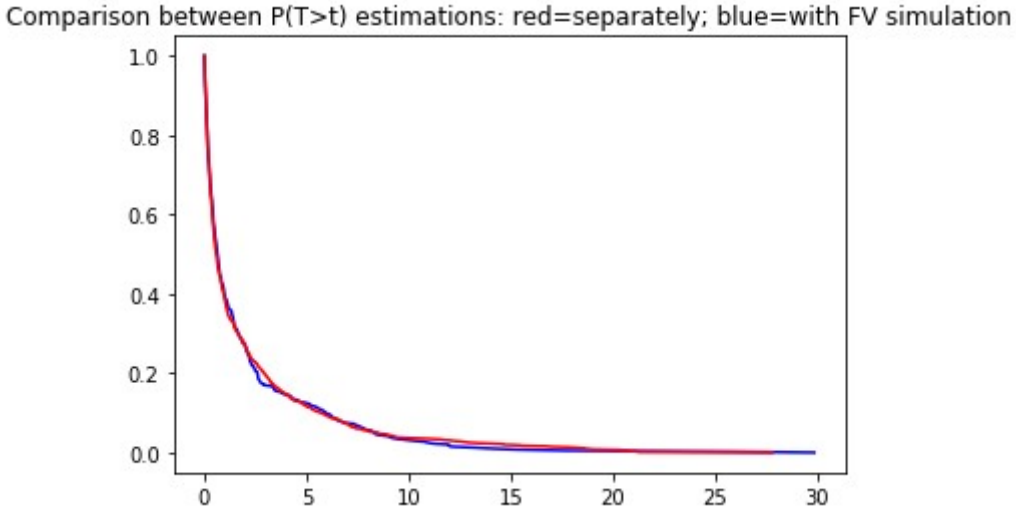
K=5, rhos=[0.4, 0.75, 0.35], N=400, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.5(n=400), finalize=ABS, seed=1737



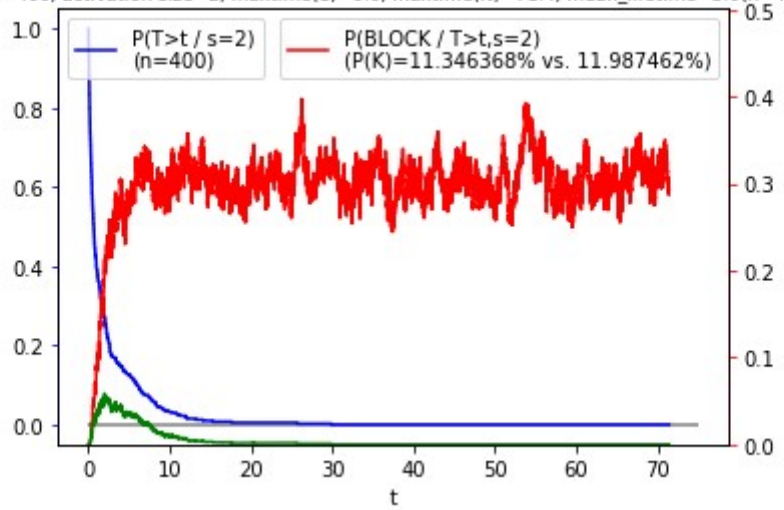
<matplotlib.figure.Figure at 0x1dd6bfae550>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

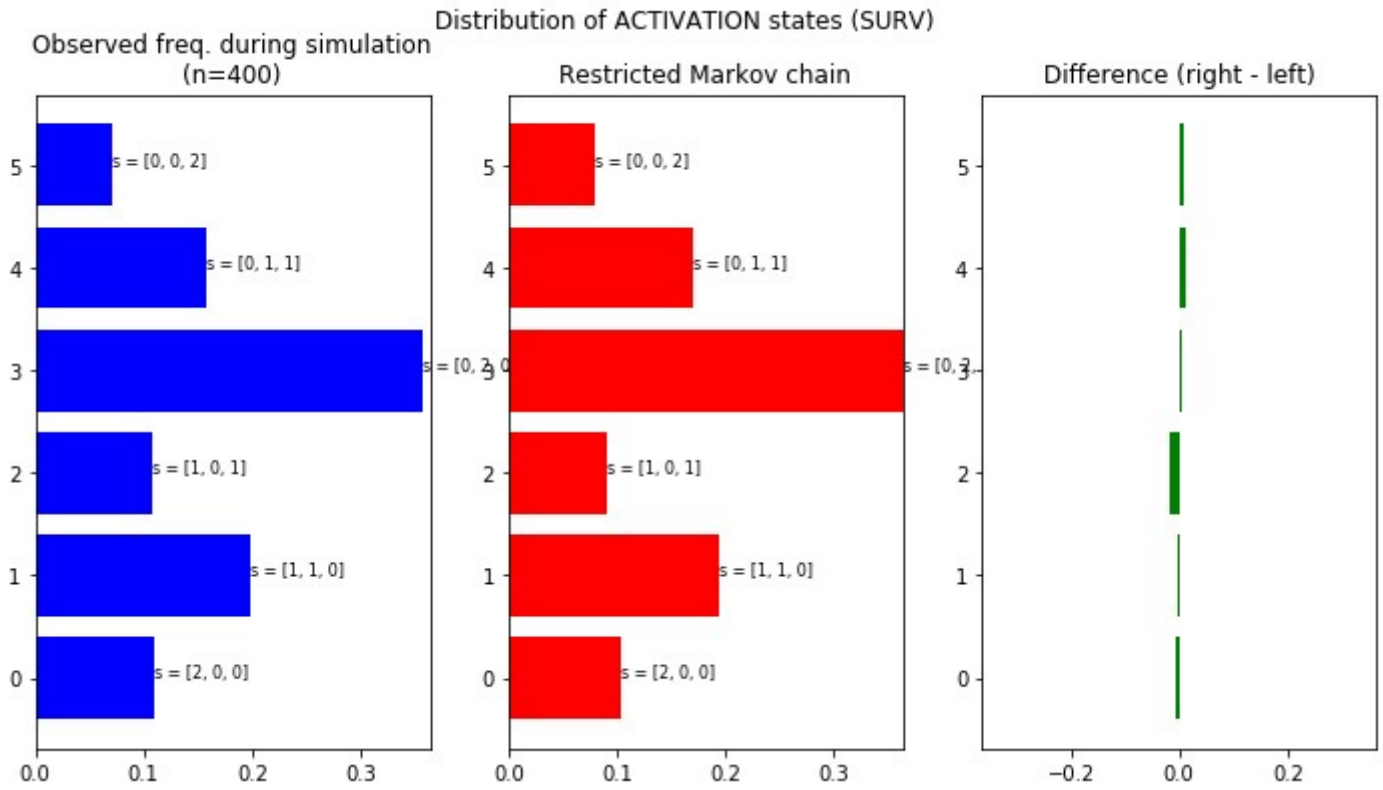

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

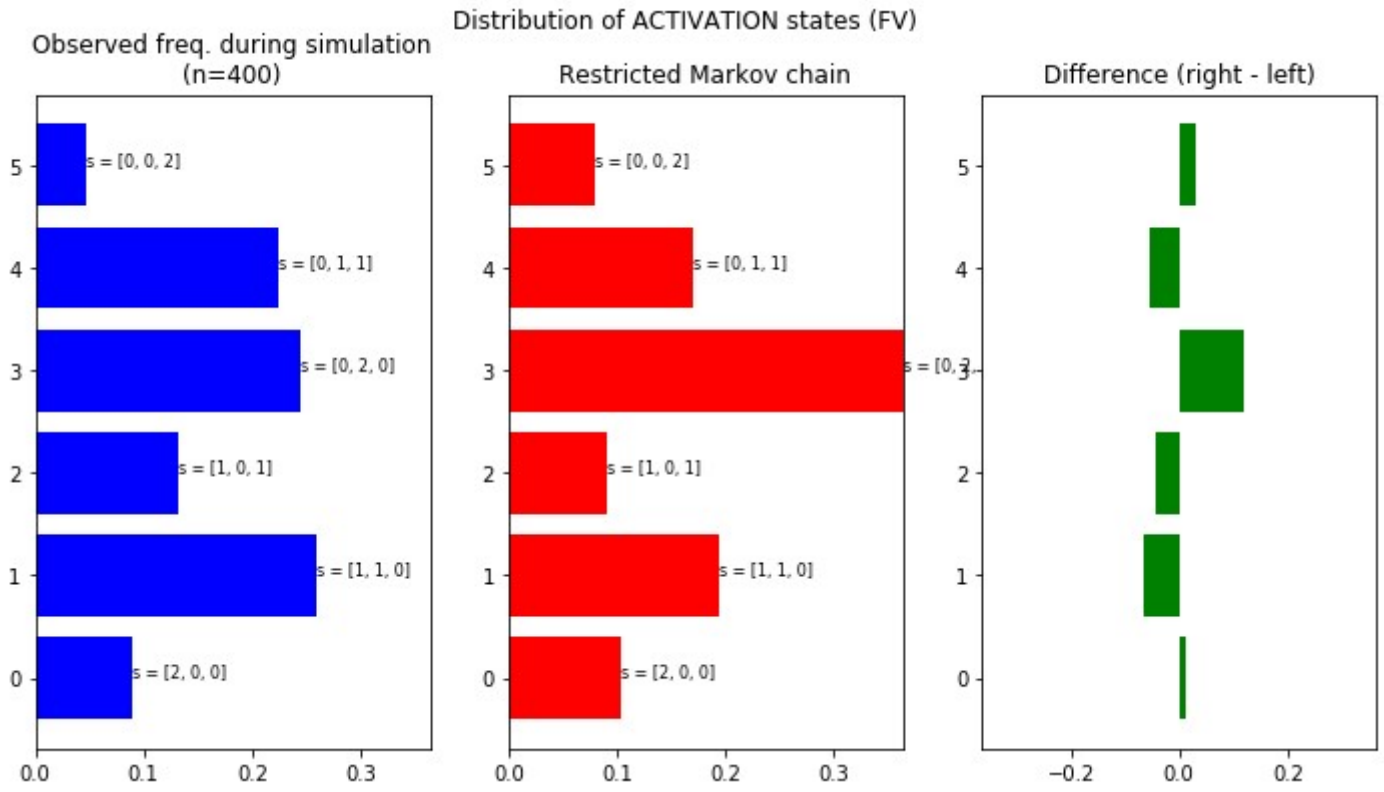


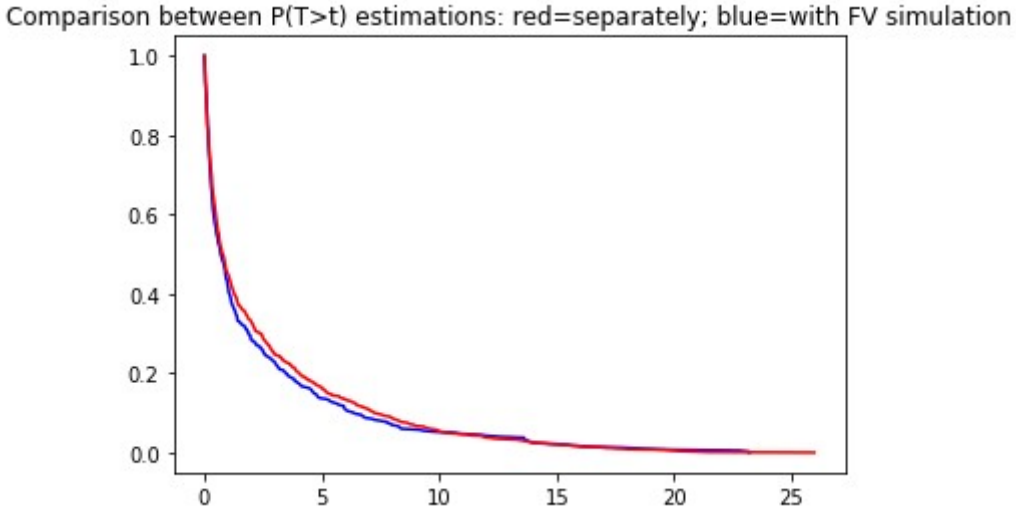
K=5, rhos=[0.4, 0.75, 0.35], N=400, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.0(n=400), finalize=ABS, seed=1747



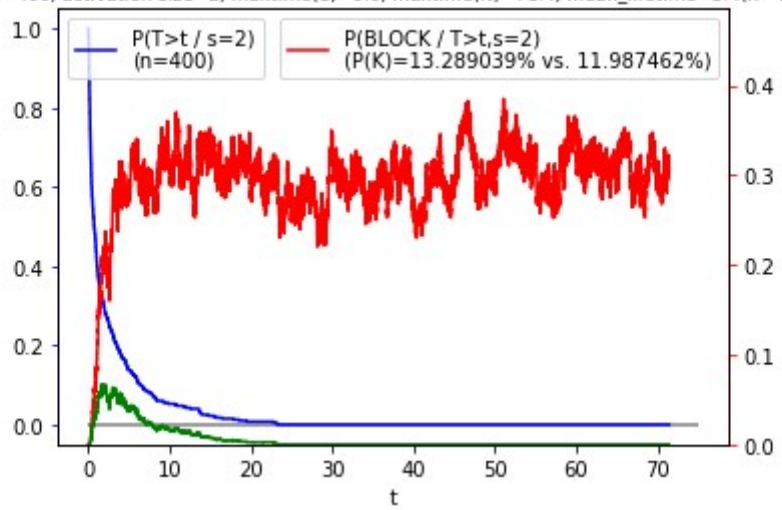
<matplotlib.figure.Figure at 0x1dd6a90d898>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

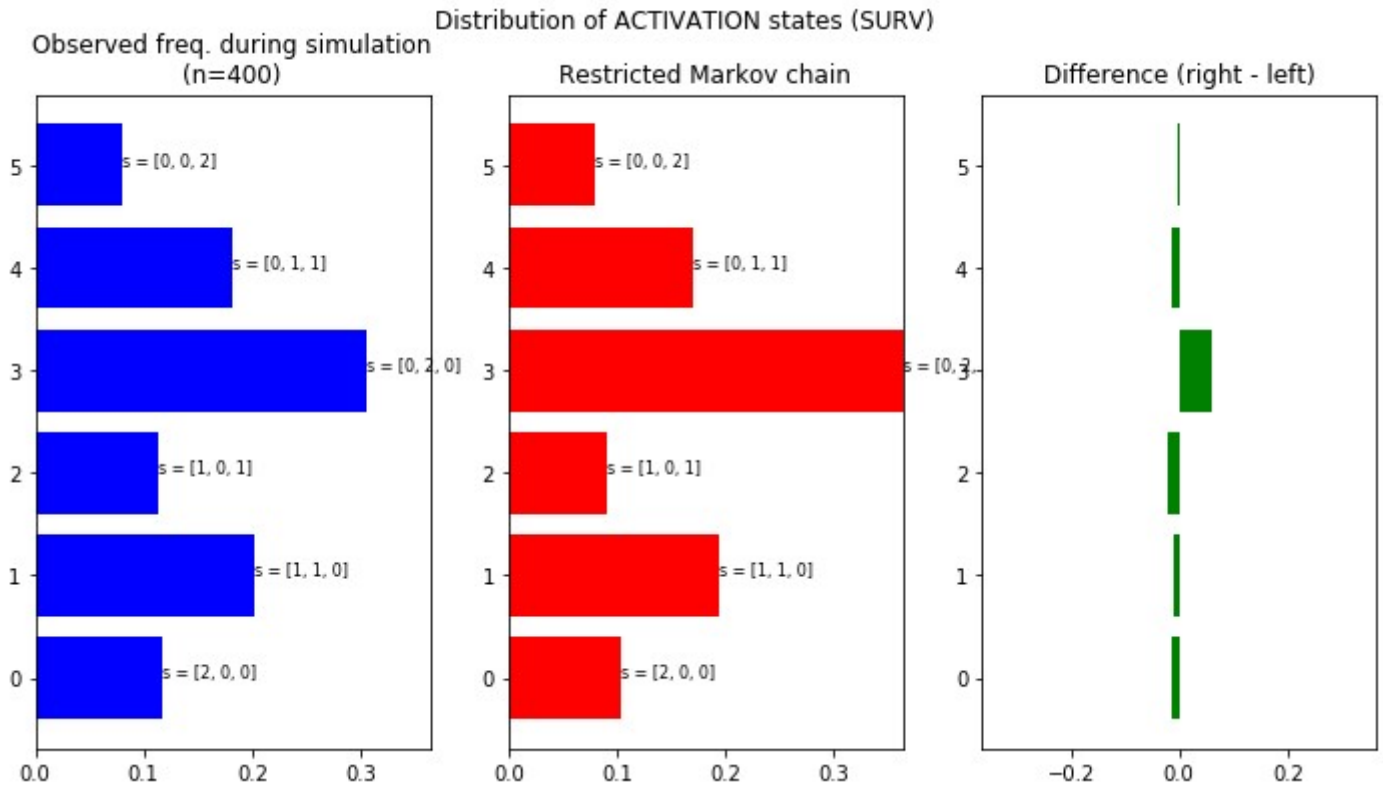

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

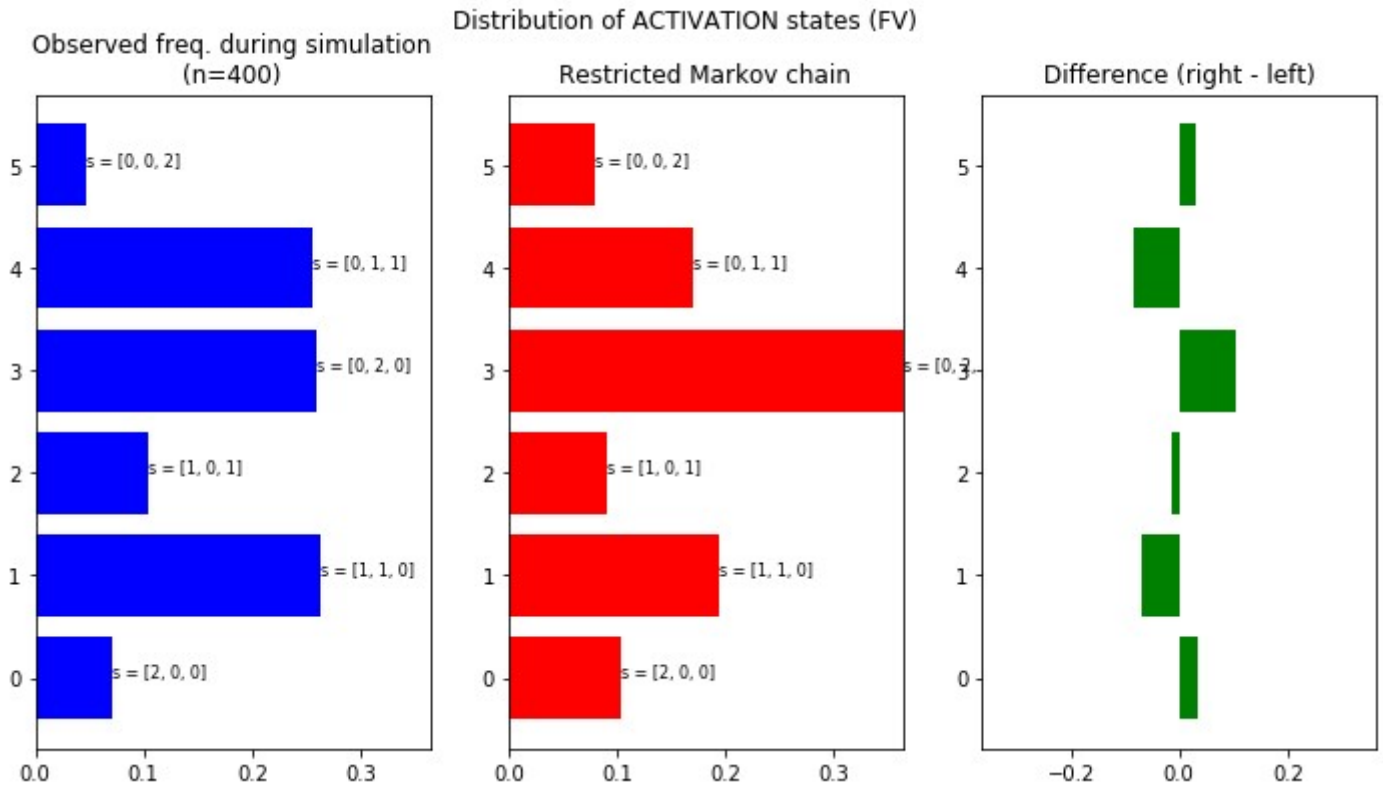


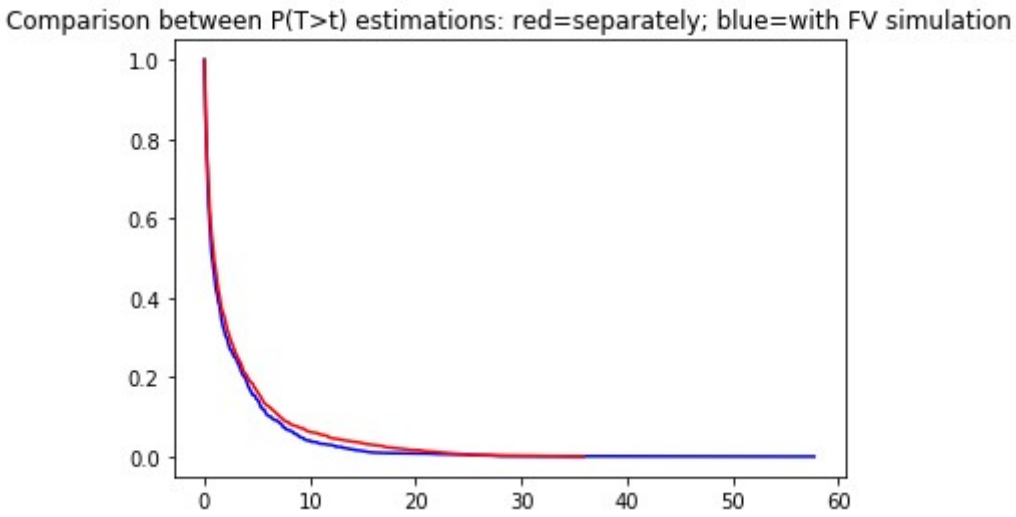
K=5, rhos=[0.4, 0.75, 0.35], N=400, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.4(n=400), finalize=ABS, seed=1757



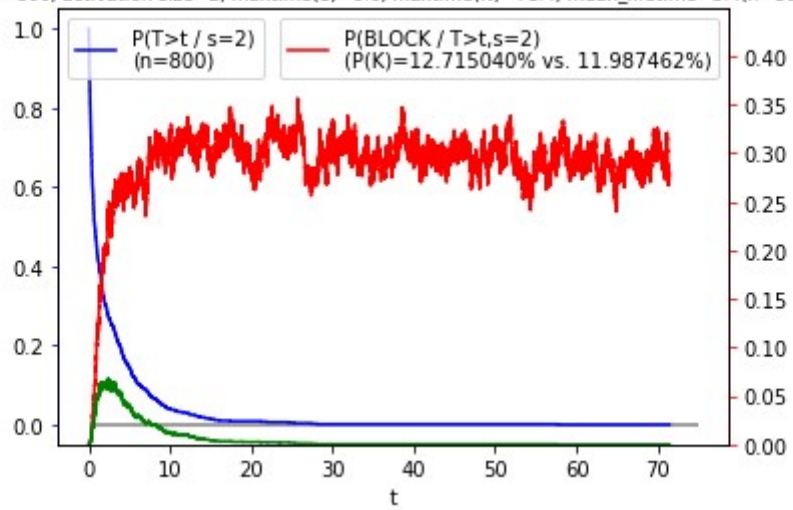
<matplotlib.figure.Figure at 0x1dd69025748>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0
1
2
3
4
5
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

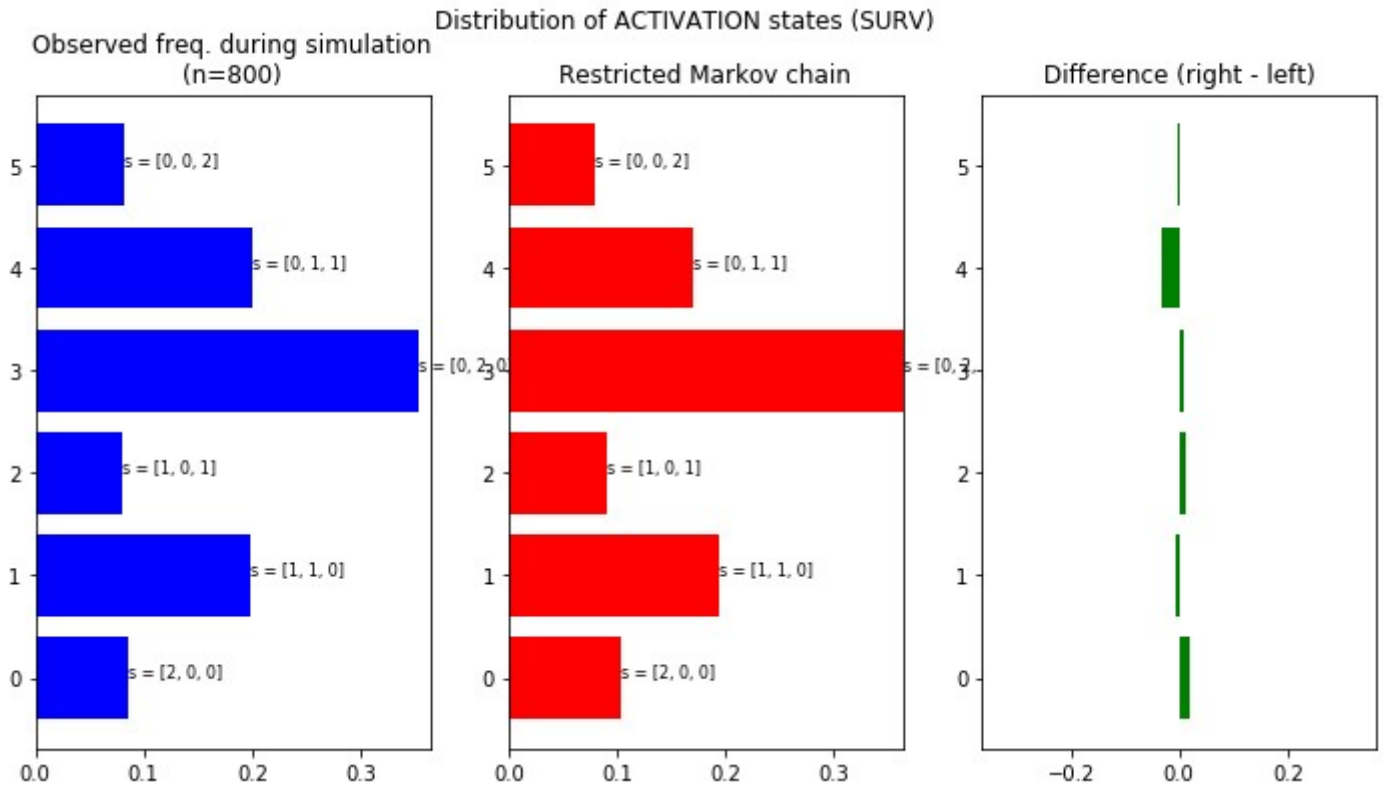

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

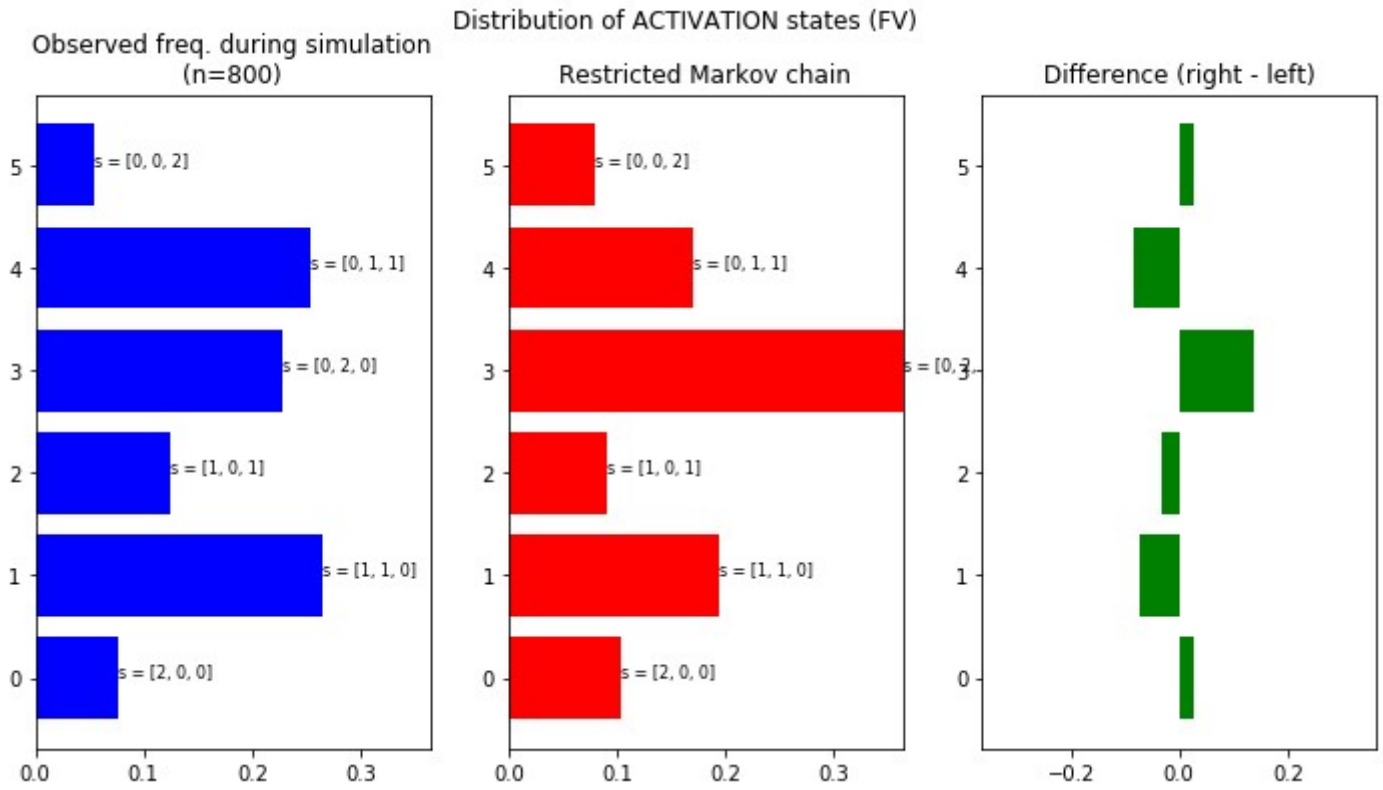


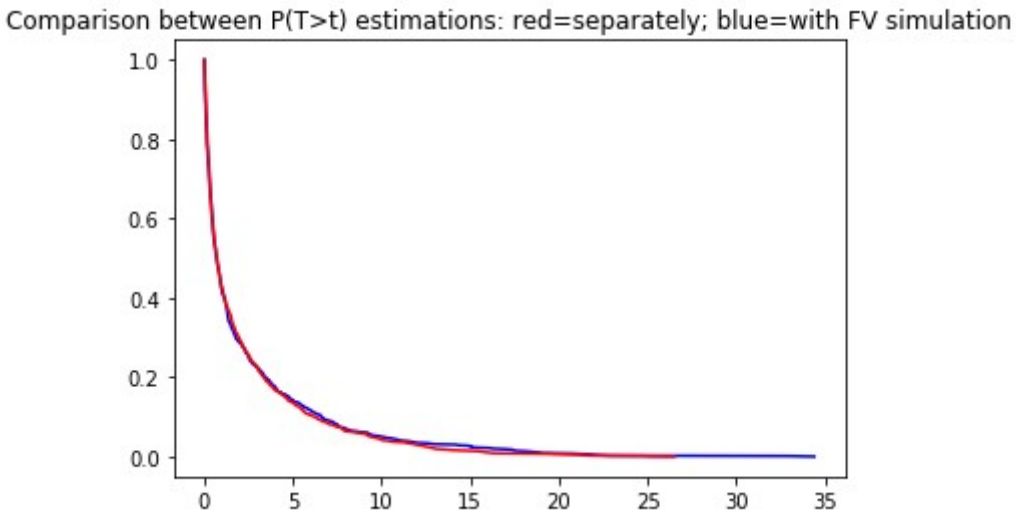
K=5, rhos=[0.4, 0.75, 0.35], N=800, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.4(n=800), finalize=ABS, seed=1717



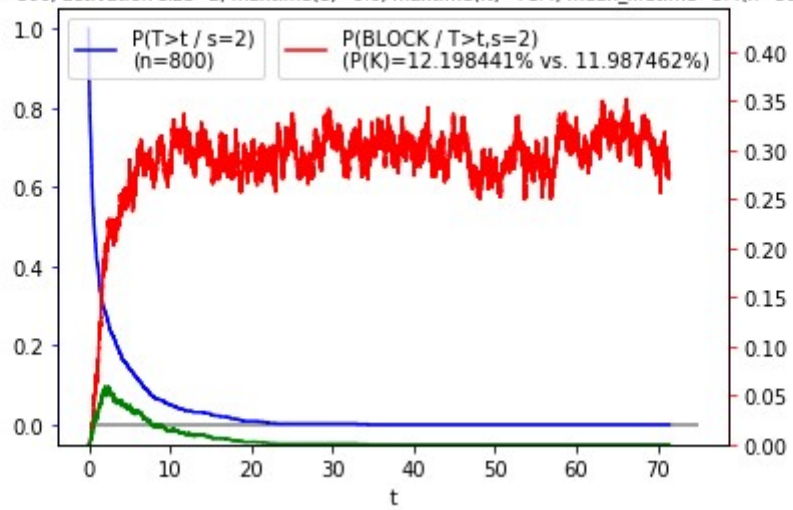
<matplotlib.figure.Figure at 0x1dd62a5b7b8>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

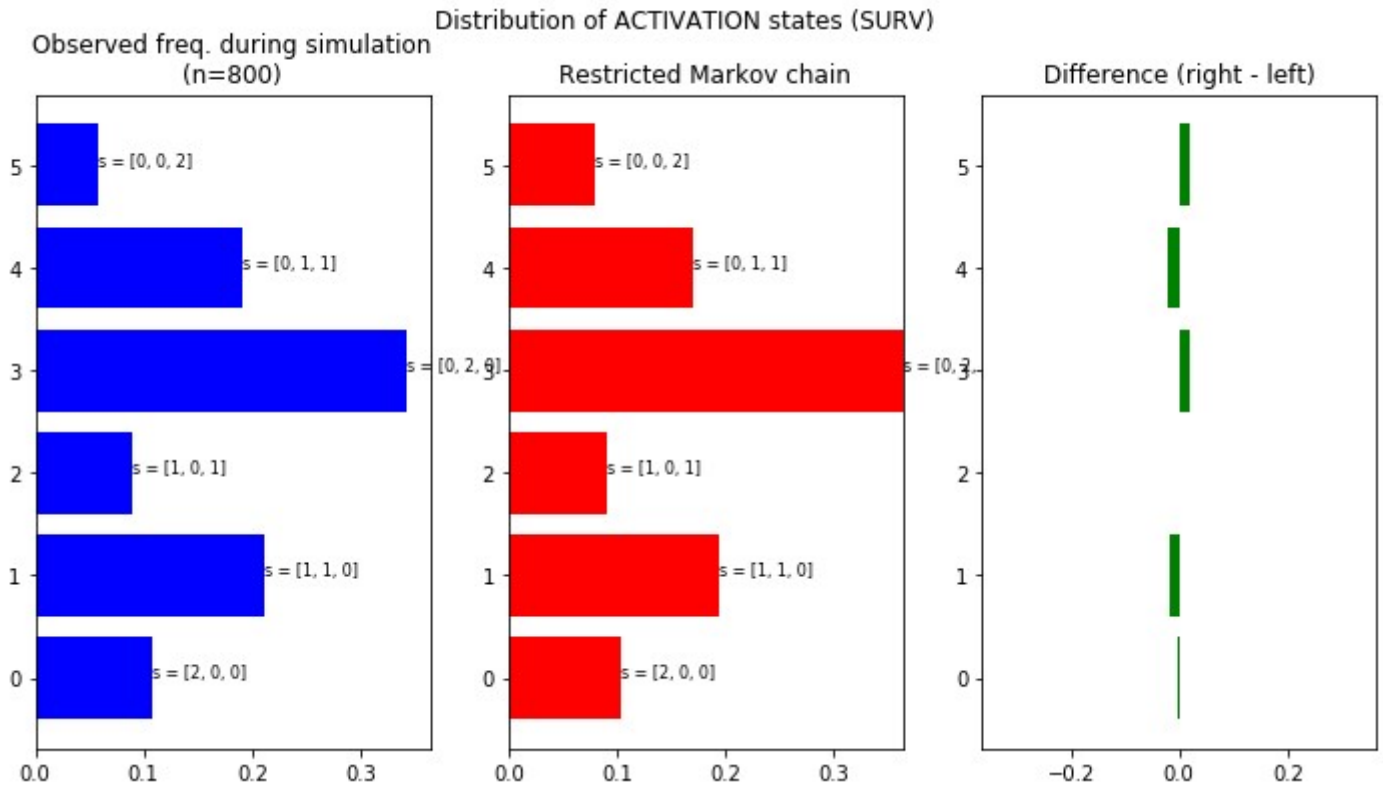

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2
0
1
2
3
4
5

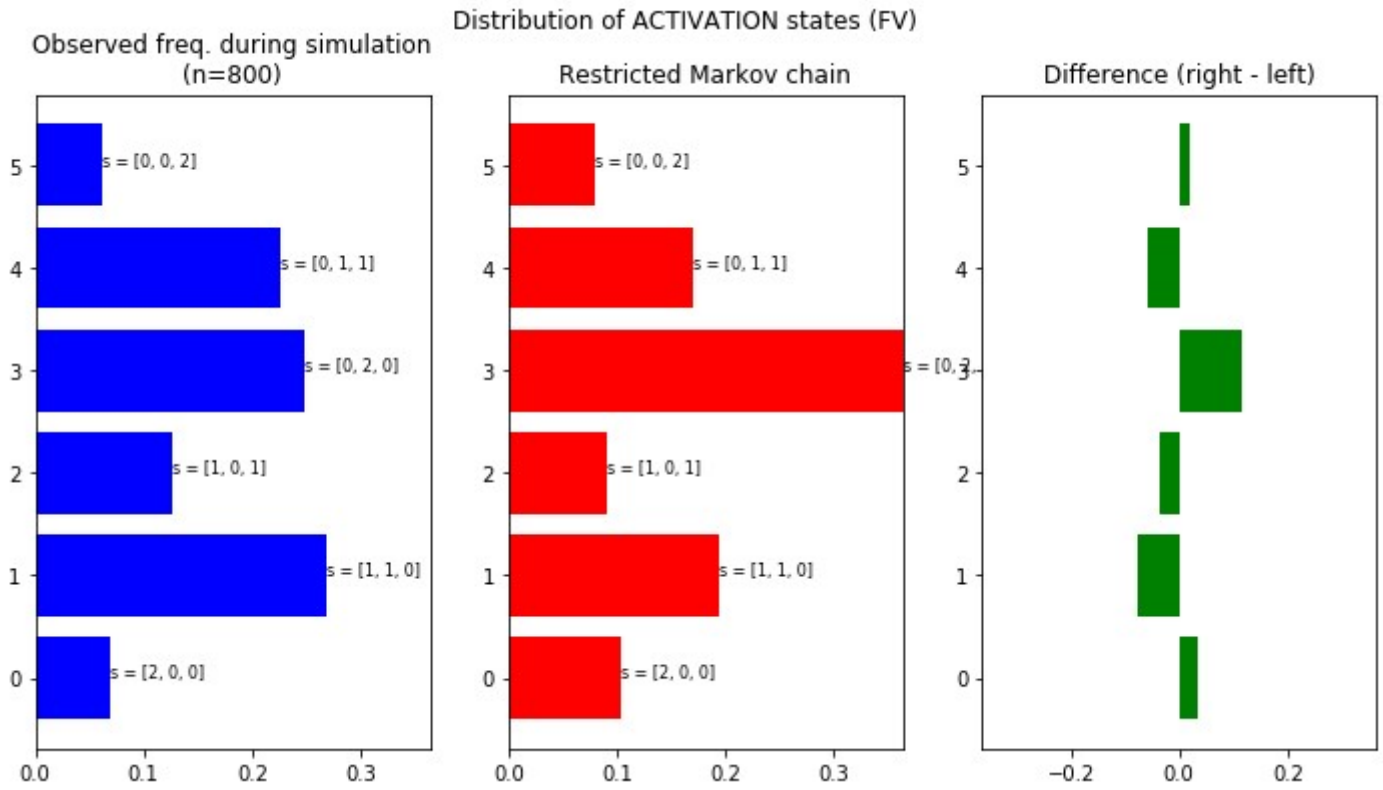


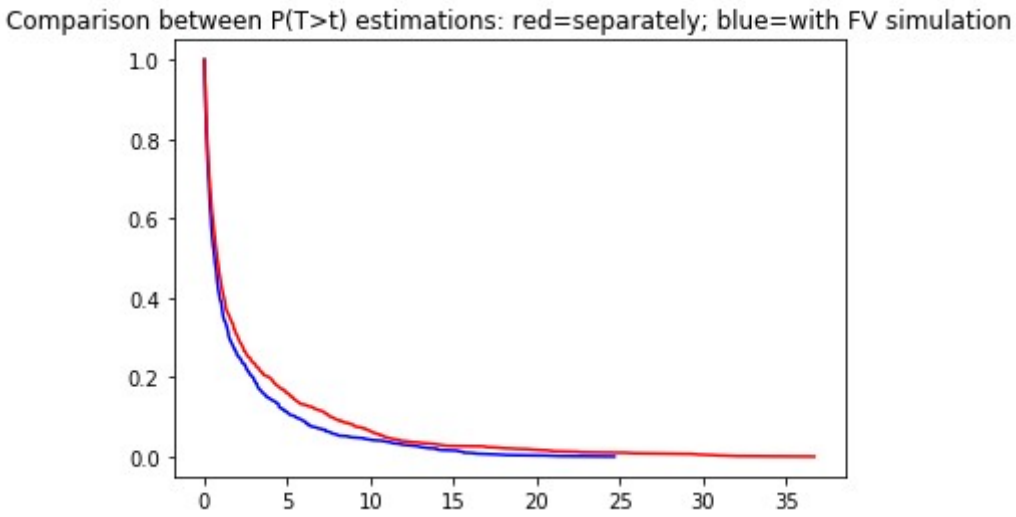
K=5, rhos=[0.4, 0.75, 0.35], N=800, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.4(n=800), finalize=ABS, seed=1727



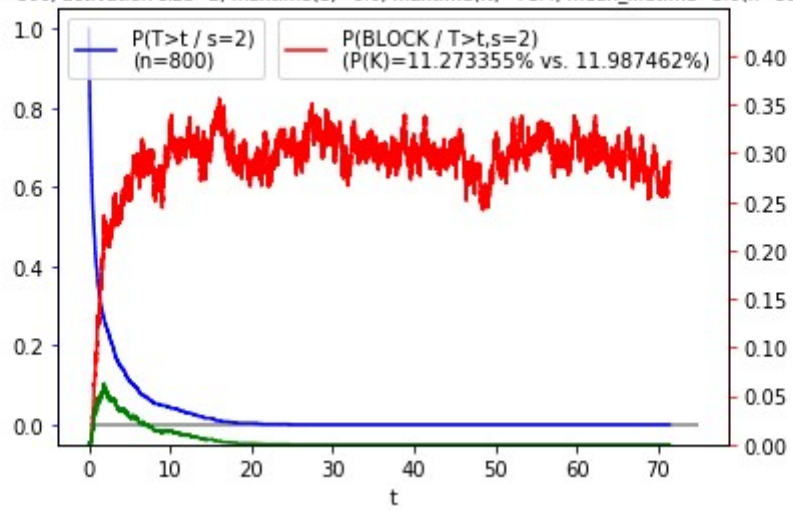
<matplotlib.figure.Figure at 0x1dd676b9eb8>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2


Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2



K=5, rhos=[0.4, 0.75, 0.35], N=800, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.0(n=800), finalize=ABS, seed=1737



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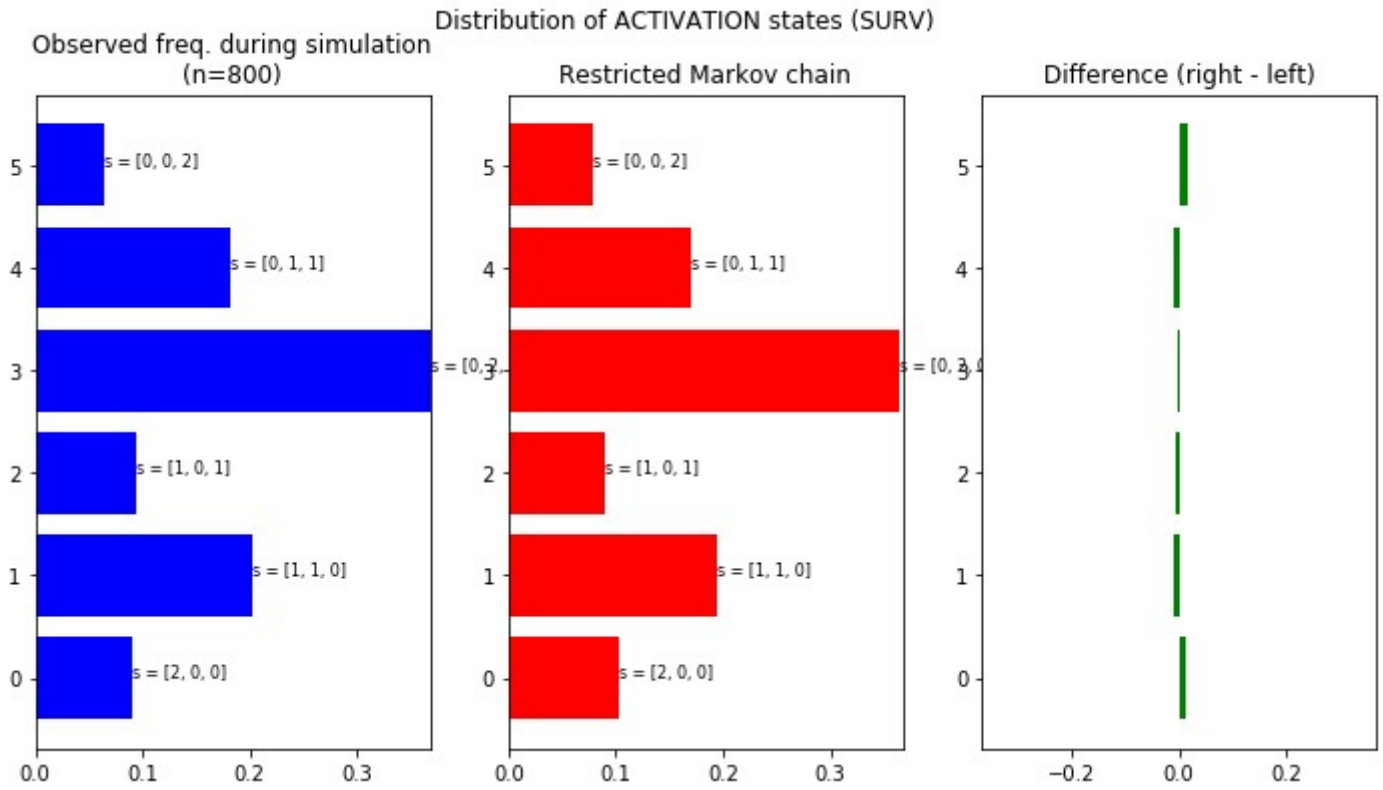
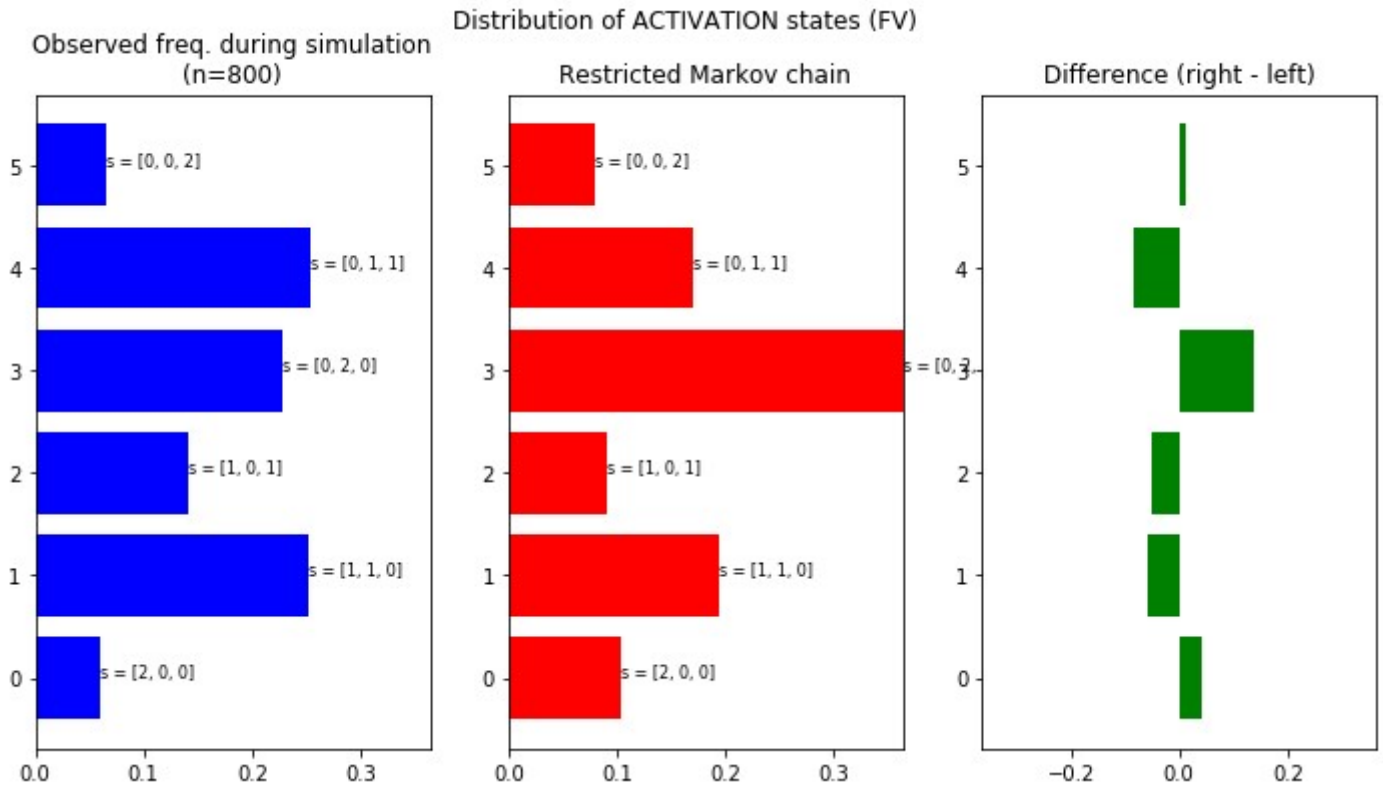
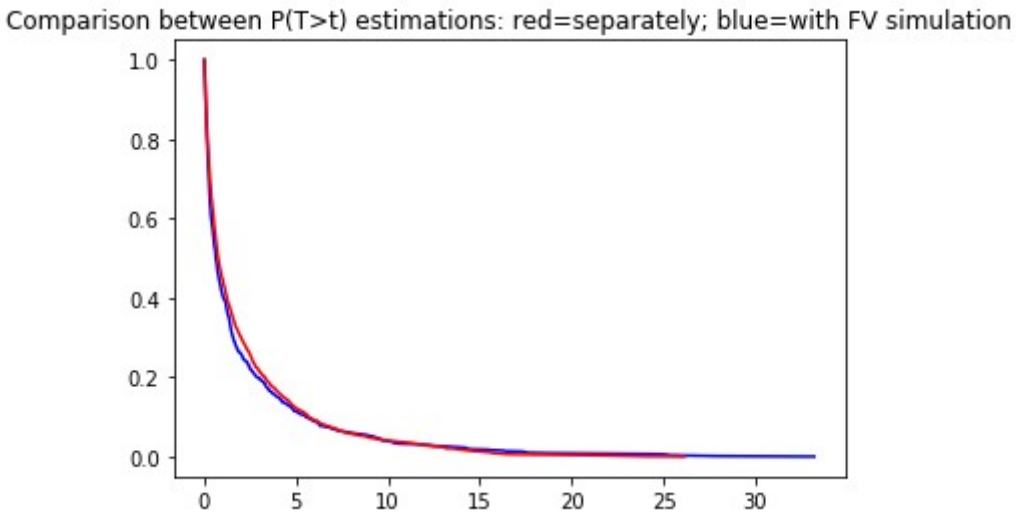
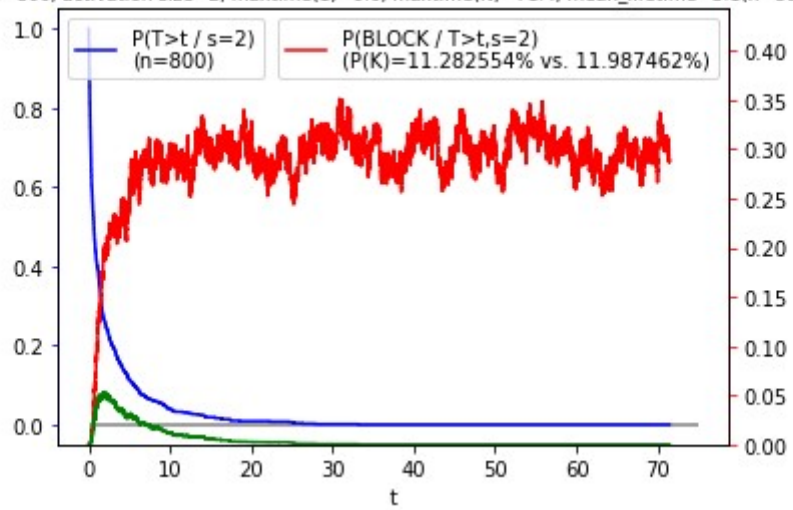

Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

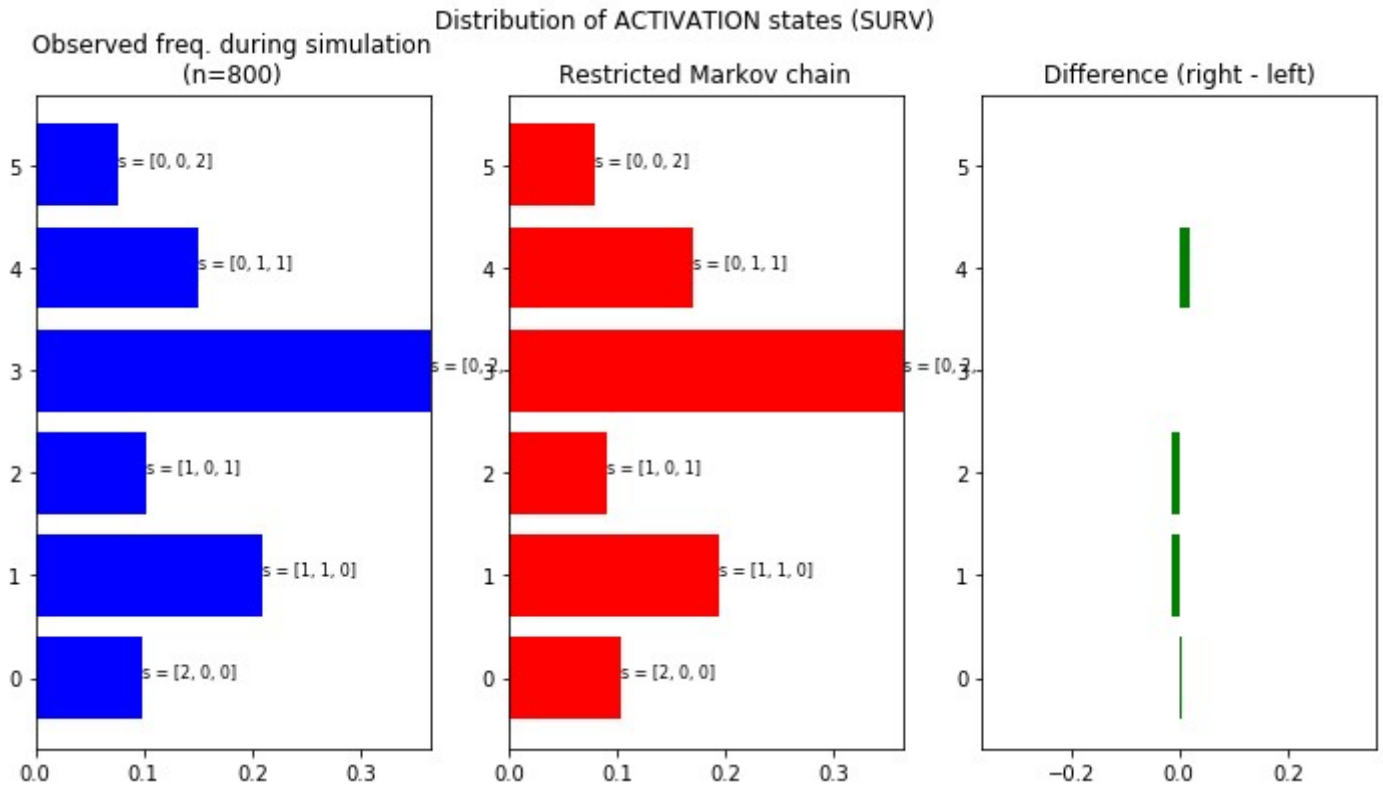

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

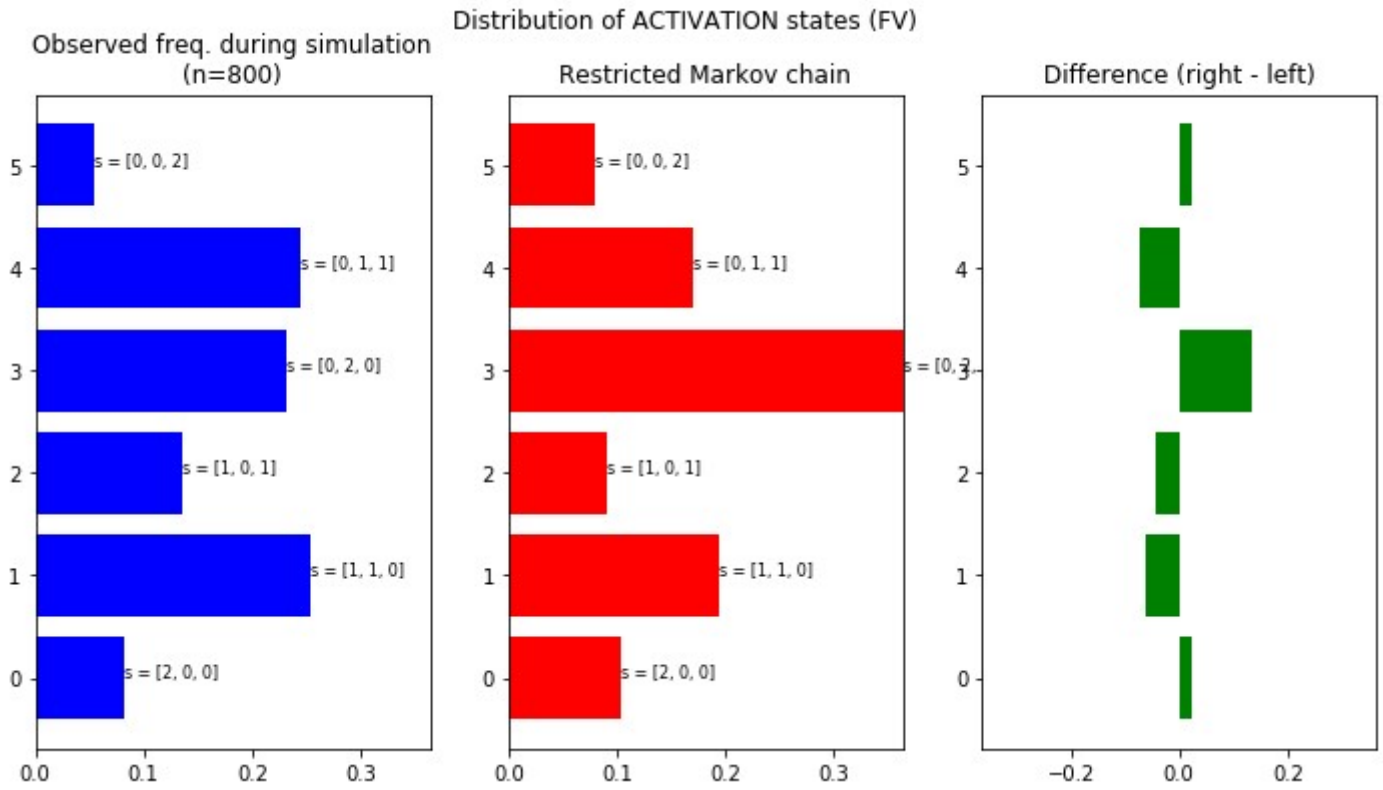


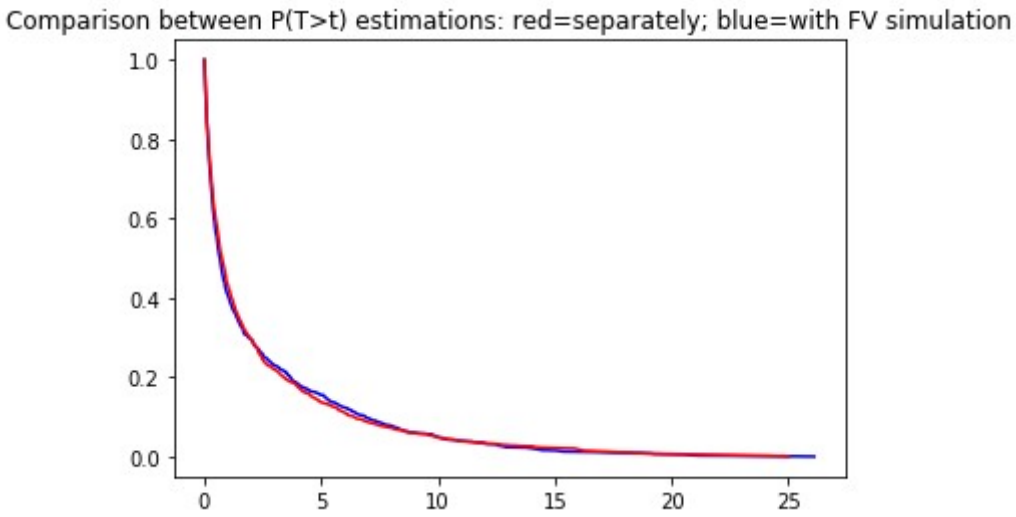
K=5, rhos=[0.4, 0.75, 0.35], N=800, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.1(n=800), finalize=ABS, seed=1747



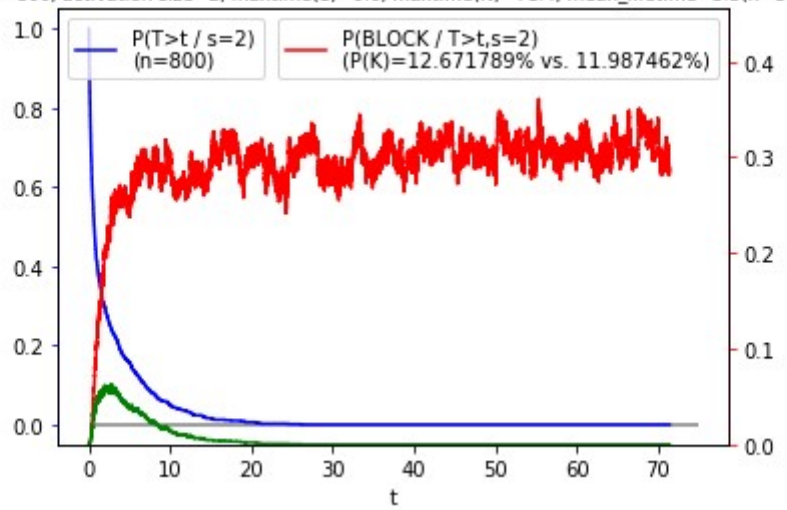
<matplotlib.figure.Figure at 0x1dd628b43c8>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

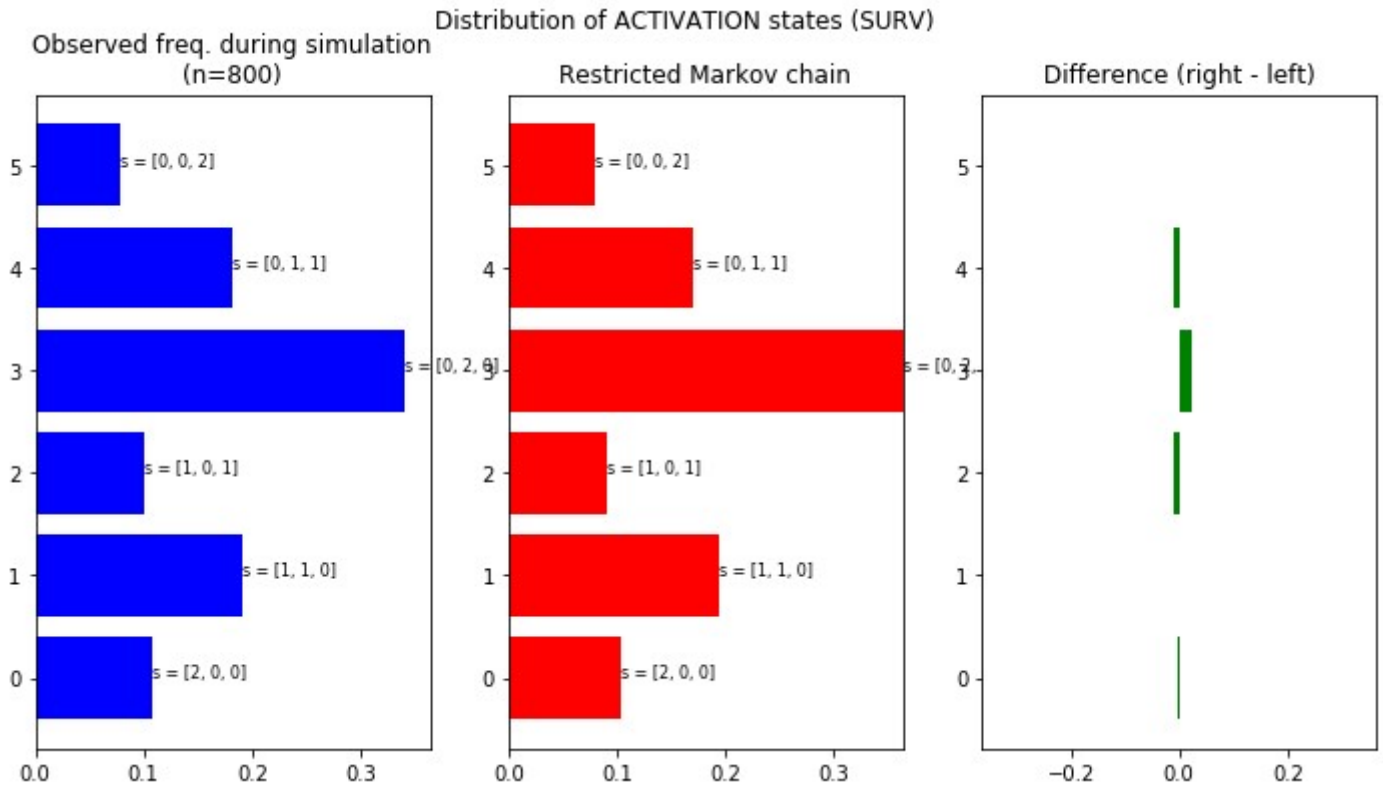

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2

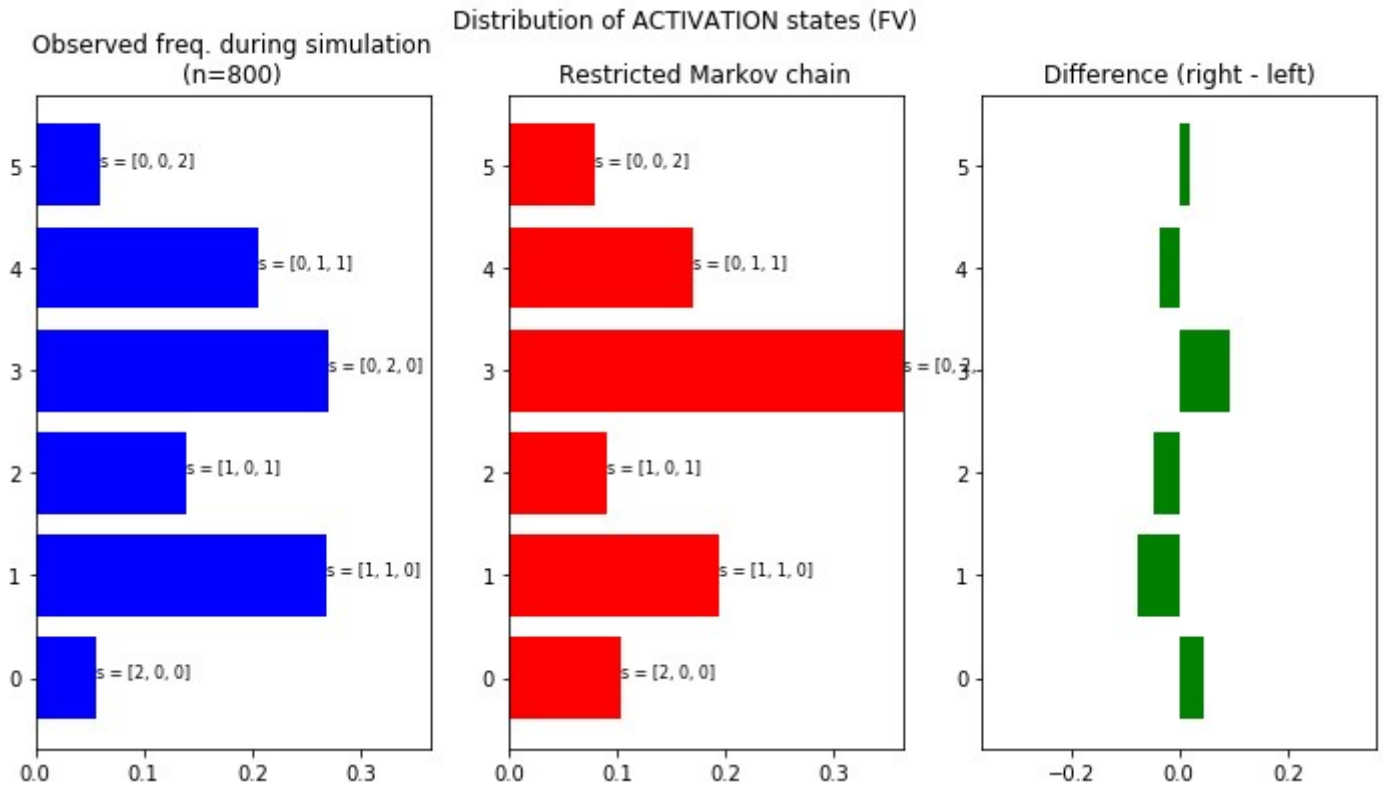


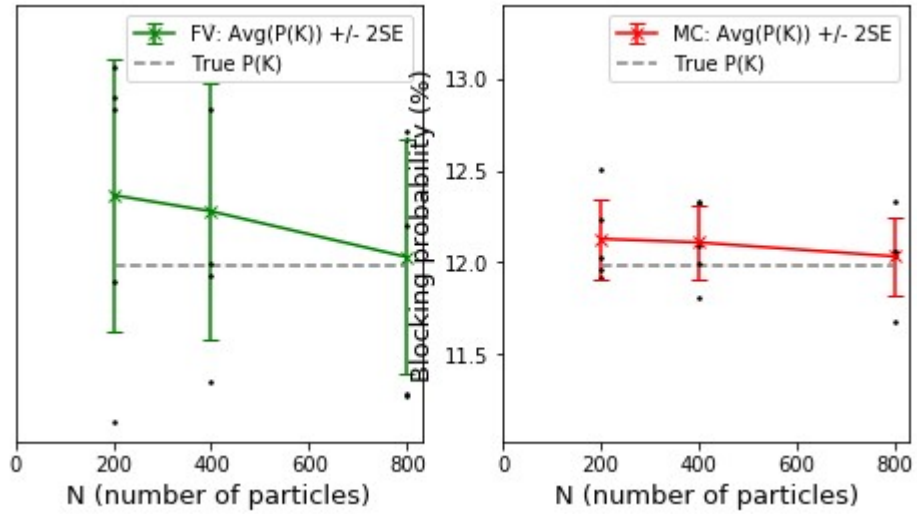
K=5, rhos=[0.4, 0.75, 0.35], N=800, activation size=2, maxtime(1)=0.0, maxtime(N)=71.4, mean_lifetime=3.3(n=800), finalize=ABS, seed=1757

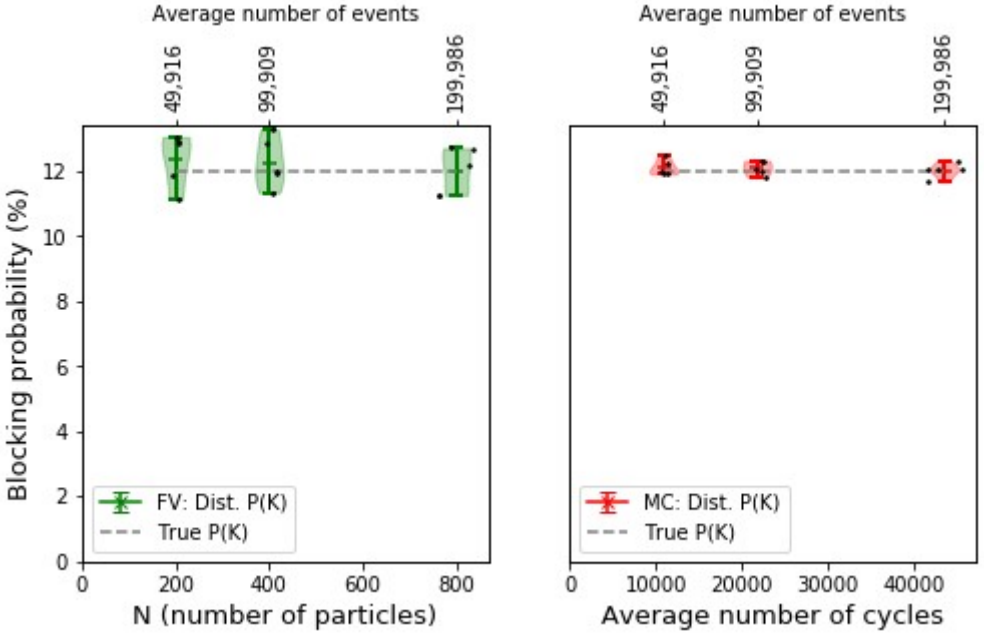


<matplotlib.figure.Figure at 0x1dd61a8e198>


Distribution of ACTIVATION states (SURV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2


Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 0, 2]
s = [0, 1, 1]
s = [0, 2, 0]
s = [1, 0, 1]
s = [1, 1, 0]
s = [2, 0, 0]
0.0
0.1
0.2
0.3
−0.2
0.0
0.2


FV: Avg(P(K)) +/- 2SE
True P(K)
MC: Avg(P(K)) +/- 2SE
True P(K)
Blocking probability (%)
N (number of particles)
N (number of particles)


Average number of events
49,916
99,909
199,986
Average number of events
49,916
99,909
199,986
Blocking probability (%)
FV: Dist. P(K)
True P(K)
MC: Dist. P(K)
True P(K)
N (number of particles)
Average number of cycles

In [2]: