```
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.

Restarting kernel...
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```
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=20, rhos=[0.4, 0.75, 0.35], buffer_size_activation=10

*** Running simulation for nparticles=400 (1 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #2 out of 55: [0, 0] (n=1, n/N=0.0025, p=0.001640, diff=0.5%, state=[8, 1, 0])
Range of particle indices to simulate with start state #4 out of 55: [1, 1] (n=1, n/N=0.0025, p=0.003074, diff=-0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #8 out of 55: [2, 2] (n=1, n/N=0.0025, p=0.002690, diff=-0.1%, state=[6, 2, 1])
Range of particle indices to simulate with start state #11 out of 55: [3, 3] (n=1, n/N=0.0025, p=0.010808, diff=-0.8%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [4, 4] (n=1, n/N=0.0025, p=0.005044, diff=-0.5%, state=[5, 3, 1])
Range of particle indices to simulate with start state #14 out of 55: [5, 5] (n=1, n/N=0.0025, p=0.001098, diff=1.3%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [6, 11] (n=6, n/N=0.015, p=0.020266, diff=-0.3%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [12, 14] (n=3, n/N=0.0075, p=0.009457, diff=-0.2%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [15, 17] (n=3, n/N=0.0075, p=0.004413, diff=0.7%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [18, 18] (n=1, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [19, 19] (n=1, n/N=0.0025, p=0.000961, diff=1.6%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [20, 37] (n=18, n/N=0.045, p=0.037998, diff=0.2%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [38, 43] (n=6, n/N=0.015, p=0.017733, diff=-0.2%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [44, 48] (n=5, n/N=0.0125, p=0.008275, diff=0.5%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [49, 49] (n=1, n/N=0.0025, p=0.003862, diff=-0.4%, state=[3, 3, 3])
Range of particle indices to simulate with start state #27 out of 55: [50, 50] (n=1, n/N=0.0025, p=0.000841, diff=2.0%, state=[3, 1, 5])
Range of particle indices to simulate with start state #29 out of 55: [51, 79] (n=29, n/N=0.0725, p=0.071247, diff=0.0%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [80, 96] (n=17, n/N=0.0425, p=0.033249, diff=0.3%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [97, 103] (n=7, n/N=0.0175, p=0.015516, diff=0.1%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [104, 105] (n=2, n/N=0.005, p=0.007241, diff=-0.3%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [106, 106] (n=1, n/N=0.0025, p=0.003379, diff=-0.3%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [107, 107] (n=1, n/N=0.0025, p=0.001577, diff=0.6%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [108, 160] (n=53, n/N=0.1325, p=0.133588, diff=-0.0%, state=[1, 8, 0])
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Range of particle indices to simulate with start state #38 out of 55: [161, 186] (n=26, n/N=0.065, p=0.062341, diff=0.0%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [187, 194] (n=8, n/N=0.02, p=0.029093, diff=-0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [195, 201] (n=7, n/N=0.0175, p=0.013577, diff=0.3%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [202, 202] (n=1, n/N=0.0025, p=0.006336, diff=-0.6%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [203, 203] (n=1, n/N=0.0025, p=0.002957, diff=-0.2%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [204, 204] (n=1, n/N=0.0025, p=0.001380, diff=0.8%, state=[1, 2, 6])
Range of particle indices to simulate with start state #46 out of 55: [205, 308] (n=104, n/N=0.26, p=0.250478, diff=0.0%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [309, 362] (n=54, n/N=0.135, p=0.116890, diff=0.2%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [363, 385] (n=23, n/N=0.0575, p=0.054549, diff=0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [386, 394] (n=9, n/N=0.0225, p=0.025456, diff=-0.1%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [395, 395] (n=1, n/N=0.0025, p=0.011879, diff=-0.8%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [396, 399] (n=4, n/N=0.01, p=0.005544, diff=0.8%, state=[0, 4, 5])
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=714.3 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: 914.1 sec, 15.2 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 #46 out of 66: [0, 0] (n=1, n/N=1.0, p=0.133206, diff=6.5%, state=[1, 9, 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=857142.9 or #events=983157)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=397.483, n=733
P=0: [<EventType.ABSORPTION: 0>] events at time 328141.6 removed.
P=0: Blocking time AFTER removal: t=397.483, n=733
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 24590 (38.3% of simulation time T=857142.9)
execution time: 718.8 sec, 12.0 min
execution time MC + FV: 1632.9 sec, 27.2 min
Computing TRUE blocking probability for nservers=3, K=20, rhos=[0.4, 0.75, 0.35]...
        P(K) by MC: 0.121132% (simulation time = 857142.9)
        P(K) estimated by FV: 0.071763%, E(T) = 26.3 (simulation time = 714.3)
        True P(K): 0.124693%




        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1727)...
Range of particle indices to simulate with start state #2 out of 55: [0, 1] (n=2, n/N=0.005, p=0.001640, diff=2.0%, state=[8, 1, 0])
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Range of particle indices to simulate with start state #4 out of 55: [2, 4] (n=3, n/N=0.0075, p=0.003074, diff=1.4%, state=[7, 2, 0])
Range of particle indices to simulate with start state #7 out of 55: [5, 5] (n=1, n/N=0.0025, p=0.005765, diff=-0.6%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [6, 6] (n=1, n/N=0.0025, p=0.002690, diff=-0.1%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [7, 7] (n=1, n/N=0.0025, p=0.001255, diff=1.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [8, 10] (n=3, n/N=0.0075, p=0.010808, diff=-0.3%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [11, 12] (n=2, n/N=0.005, p=0.005044, diff=-0.0%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [13, 16] (n=4, n/N=0.01, p=0.002354, diff=3.2%, state=[5, 2, 2])
Range of particle indices to simulate with start state #16 out of 55: [17, 28] (n=12, n/N=0.03, p=0.020266, diff=0.5%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [29, 35] (n=7, n/N=0.0175, p=0.009457, diff=0.9%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [36, 36] (n=1, n/N=0.0025, p=0.004413, diff=-0.4%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [37, 37] (n=1, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #22 out of 55: [38, 46] (n=9, n/N=0.0225, p=0.037998, diff=-0.4%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [47, 49] (n=3, n/N=0.0075, p=0.017733, diff=-0.6%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [50, 51] (n=2, n/N=0.005, p=0.008275, diff=-0.4%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [52, 53] (n=2, n/N=0.005, p=0.003862, diff=0.3%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [54, 54] (n=1, n/N=0.0025, p=0.001802, diff=0.4%, state=[3, 2, 4])
Range of particle indices to simulate with start state #29 out of 55: [55, 84] (n=30, n/N=0.075, p=0.071247, diff=0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [85, 97] (n=13, n/N=0.0325, p=0.033249, diff=-0.0%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [98, 106] (n=9, n/N=0.0225, p=0.015516, diff=0.5%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [107, 109] (n=3, n/N=0.0075, p=0.007241, diff=0.0%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [110, 113] (n=4, n/N=0.01, p=0.003379, diff=2.0%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [114, 114] (n=1, n/N=0.0025, p=0.001577, diff=0.6%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [115, 170] (n=56, n/N=0.14, p=0.133588, diff=0.0%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [171, 186] (n=16, n/N=0.04, p=0.062341, diff=-0.4%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [187, 201] (n=15, n/N=0.0375, p=0.029093, diff=0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [202, 212] (n=11, n/N=0.0275, p=0.013577, diff=1.0%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [213, 213] (n=1, n/N=0.0025, p=0.006336, diff=-0.6%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [214, 215] (n=2, n/N=0.005, p=0.002957, diff=0.7%, state=[1, 3, 5])
Range of particle indices to simulate with start state #46 out of 55: [216, 318] (n=103, n/N=0.2575, p=0.250478, diff=0.0%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [319, 368] (n=50, n/N=0.125, p=0.116890, diff=0.1%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [369, 388] (n=20, n/N=0.05, p=0.054549, diff=-0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [389, 393] (n=5, n/N=0.0125, p=0.025456, diff=-0.5%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [394, 398] (n=5, n/N=0.0125, p=0.011879, diff=0.1%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [399, 399] (n=1, n/N=0.0025, p=0.005544, diff=-0.5%, state=[0, 4, 5])
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=714.3 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: 777.3 sec, 13.0 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 #37 out of 66: [0, 0] (n=1, n/N=1.0, p=0.071043, diff=13.1%, state=[2, 8, 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.
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Generating trajectories for each particle until END OF SIMULATION (T=857142.9 or #events=978577)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=405.456, n=796
P=0: [<EventType.ABSORPTION: 0>] events at time 325851.9 removed.
P=0: Blocking time AFTER removal: t=405.456, n=796
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 24863 (38.0% of simulation time T=857142.9)
execution time: 718.5 sec, 12.0 min
execution time MC + FV: 1497.1 sec, 25.0 min
        P(K) by MC: 0.124429% (simulation time = 857142.9)
        P(K) estimated by FV: 0.141183%, E(T) = 24.5 (simulation time = 714.3)
        True P(K): 0.124693%



        Replication 3 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1737)...
Range of particle indices to simulate with start state #4 out of 55: [0, 0] (n=1, n/N=0.0025, p=0.003074, diff=-0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [1, 1] (n=1, n/N=0.0025, p=0.001435, diff=0.7%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [2, 3] (n=2, n/N=0.005, p=0.005765, diff=-0.1%, state=[6, 3, 0])
Range of particle indices to simulate with start state #11 out of 55: [4, 5] (n=2, n/N=0.005, p=0.010808, diff=-0.5%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [6, 8] (n=3, n/N=0.0075, p=0.005044, diff=0.5%, state=[5, 3, 1])
Range of particle indices to simulate with start state #16 out of 55: [9, 16] (n=8, n/N=0.02, p=0.020266, diff=-0.0%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [17, 18] (n=2, n/N=0.005, p=0.009457, diff=-0.5%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [19, 19] (n=1, n/N=0.0025, p=0.004413, diff=-0.4%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [20, 22] (n=3, n/N=0.0075, p=0.002060, diff=2.6%, state=[4, 2, 3])
Range of particle indices to simulate with start state #22 out of 55: [23, 36] (n=14, n/N=0.035, p=0.037998, diff=-0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [37, 44] (n=8, n/N=0.02, p=0.017733, diff=0.1%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [45, 45] (n=1, n/N=0.0025, p=0.008275, diff=-0.7%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [46, 46] (n=1, n/N=0.0025, p=0.003862, diff=-0.4%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [47, 47] (n=1, n/N=0.0025, p=0.001802, diff=0.4%, state=[3, 2, 4])
Range of particle indices to simulate with start state #29 out of 55: [48, 83] (n=36, n/N=0.09, p=0.071247, diff=0.3%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [84, 97] (n=14, n/N=0.035, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [98, 106] (n=9, n/N=0.0225, p=0.015516, diff=0.5%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [107, 110] (n=4, n/N=0.01, p=0.007241, diff=0.4%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [111, 112] (n=2, n/N=0.005, p=0.003379, diff=0.5%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [113, 113] (n=1, n/N=0.0025, p=0.001577, diff=0.6%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [114, 161] (n=48, n/N=0.12, p=0.133588, diff=-0.1%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [162, 189] (n=28, n/N=0.07, p=0.062341, diff=0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [190, 205] (n=16, n/N=0.04, p=0.029093, diff=0.4%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [206, 211] (n=6, n/N=0.015, p=0.013577, diff=0.1%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [212, 214] (n=3, n/N=0.0075, p=0.006336, diff=0.2%, state=[1, 4, 4])
Range of particle indices to simulate with start state #45 out of 55: [215, 215] (n=1, n/N=0.0025, p=0.000300, diff=7.3%, state=[1, 0, 8])
Range of particle indices to simulate with start state #46 out of 55: [216, 319] (n=104, n/N=0.26, p=0.250478, diff=0.0%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [320, 369] (n=50, n/N=0.125, p=0.116890, diff=0.1%, state=[0, 8, 1])
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Range of particle indices to simulate with start state #48 out of 55: [370, 384] (n=15, n/N=0.0375, p=0.054549, diff=-0.3%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [385, 390] (n=6, n/N=0.015, p=0.025456, diff=-0.4%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [391, 396] (n=6, n/N=0.015, p=0.011879, diff=0.3%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [397, 398] (n=2, n/N=0.005, p=0.005544, diff=-0.1%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [399, 399] (n=1, n/N=0.0025, p=0.002587, diff=-0.0%, state=[0, 3, 6])
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=714.3 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: 771.6 sec, 12.9 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 #56 out of 66: [0, 0] (n=1, n/N=1.0, p=0.249761, diff=3.0%, state=[0, 10, 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=857142.9 or #events=978275)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=363.960, n=763
P=0: [<EventType.ABSORPTION: 0>] events at time 325868.5 removed.
P=0: Blocking time AFTER removal: t=363.960, n=763
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 25429 (38.0% of simulation time T=857142.9)
execution time: 734.7 sec, 12.2 min
execution time MC + FV: 1507.7 sec, 25.1 min
        P(K) by MC: 0.111689% (simulation time = 857142.9)
        P(K) estimated by FV: 0.217106%, E(T) = 26.0 (simulation time = 714.3)
        True P(K): 0.124693%



        Replication 4 of 5...

        --> Running Fleming-Viot estimation...
        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 55: [0, 0] (n=1, n/N=0.0025, p=0.000874, diff=1.9%, state=[9, 0, 0])
Range of particle indices to simulate with start state #2 out of 55: [1, 1] (n=1, n/N=0.0025, p=0.001640, diff=0.5%, state=[8, 1, 0])
Range of particle indices to simulate with start state #4 out of 55: [2, 2] (n=1, n/N=0.0025, p=0.003074, diff=-0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [3, 3] (n=1, n/N=0.0025, p=0.001435, diff=0.7%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [4, 6] (n=3, n/N=0.0075, p=0.005765, diff=0.3%, state=[6, 3, 0])
Range of particle indices to simulate with start state #11 out of 55: [7, 15] (n=9, n/N=0.0225, p=0.010808, diff=1.1%, state=[5, 4, 0])
Range of particle indices to simulate with start state #13 out of 55: [16, 16] (n=1, n/N=0.0025, p=0.002354, diff=0.1%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [17, 17] (n=1, n/N=0.0025, p=0.001098, diff=1.3%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [18, 21] (n=4, n/N=0.01, p=0.020266, diff=-0.5%, state=[4, 5, 0])
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Range of particle indices to simulate with start state #17 out of 55: [22, 25] (n=4, n/N=0.01, p=0.009457, diff=0.1%, state=[4, 4, 1])
Range of particle indices to simulate with start state #19 out of 55: [26, 26] (n=1, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #21 out of 55: [27, 27] (n=1, n/N=0.0025, p=0.000449, diff=4.6%, state=[4, 0, 5])
Range of particle indices to simulate with start state #22 out of 55: [28, 46] (n=19, n/N=0.0475, p=0.037998, diff=0.3%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [47, 51] (n=5, n/N=0.0125, p=0.017733, diff=-0.3%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [52, 56] (n=5, n/N=0.0125, p=0.008275, diff=0.5%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [57, 58] (n=2, n/N=0.005, p=0.003862, diff=0.3%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [59, 59] (n=1, n/N=0.0025, p=0.001802, diff=0.4%, state=[3, 2, 4])
Range of particle indices to simulate with start state #27 out of 55: [60, 60] (n=1, n/N=0.0025, p=0.000841, diff=2.0%, state=[3, 1, 5])
Range of particle indices to simulate with start state #28 out of 55: [61, 61] (n=1, n/N=0.0025, p=0.000392, diff=5.4%, state=[3, 0, 6])
Range of particle indices to simulate with start state #29 out of 55: [62, 90] (n=29, n/N=0.0725, p=0.071247, diff=0.0%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [91, 109] (n=19, n/N=0.0475, p=0.033249, diff=0.4%, state=[2, 6, 1])
Range of particle indices to simulate with start state #32 out of 55: [110, 111] (n=2, n/N=0.005, p=0.007241, diff=-0.3%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [112, 112] (n=1, n/N=0.0025, p=0.003379, diff=-0.3%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [113, 114] (n=2, n/N=0.005, p=0.001577, diff=2.2%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [115, 177] (n=63, n/N=0.1575, p=0.133588, diff=0.2%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [178, 211] (n=34, n/N=0.085, p=0.062341, diff=0.4%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [212, 218] (n=7, n/N=0.0175, p=0.029093, diff=-0.4%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [219, 223] (n=5, n/N=0.0125, p=0.013577, diff=-0.1%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [224, 224] (n=1, n/N=0.0025, p=0.006336, diff=-0.6%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [225, 227] (n=3, n/N=0.0075, p=0.002957, diff=1.5%, state=[1, 3, 5])
Range of particle indices to simulate with start state #46 out of 55: [228, 316] (n=89, n/N=0.2225, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [317, 360] (n=44, n/N=0.11, p=0.116890, diff=-0.1%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [361, 384] (n=24, n/N=0.06, p=0.054549, diff=0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [385, 389] (n=5, n/N=0.0125, p=0.025456, diff=-0.5%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [390, 393] (n=4, n/N=0.01, p=0.011879, diff=-0.2%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [394, 396] (n=3, n/N=0.0075, p=0.005544, diff=0.4%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [397, 398] (n=2, n/N=0.005, p=0.002587, diff=0.9%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [399, 399] (n=1, n/N=0.0025, p=0.001207, diff=1.1%, state=[0, 2, 7])
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=714.3 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: 760.4 sec, 12.7 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 #48 out of 66: [0, 0] (n=1, n/N=1.0, p=0.029009, diff=33.5%, state=[1, 7, 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=857142.9 or #events=972036)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=470.831, n=929
P=0: Blocking time AFTER removal: t=470.831, n=929
Estimating blocking probability with Monte-Carlo...
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        --> Number of observations for Pr(K) estimation: 25393 (37.8% of simulation time T=857142.9)
execution time: 721.6 sec, 12.0 min
execution time MC + FV: 1483.3 sec, 24.7 min
        P(K) by MC: 0.145311% (simulation time = 857142.9)
        P(K) estimated by FV: 0.054034%, E(T) = 20.6 (simulation time = 714.3)
        True P(K): 0.124693%



        Replication 5 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1757)...
Range of particle indices to simulate with start state #2 out of 55: [0, 0] (n=1, n/N=0.0025, p=0.001640, diff=0.5%, state=[8, 1, 0])
Range of particle indices to simulate with start state #4 out of 55: [1, 3] (n=3, n/N=0.0075, p=0.003074, diff=1.4%, state=[7, 2, 0])
Range of particle indices to simulate with start state #6 out of 55: [4, 4] (n=1, n/N=0.0025, p=0.000670, diff=2.7%, state=[7, 0, 2])
Range of particle indices to simulate with start state #7 out of 55: [5, 5] (n=1, n/N=0.0025, p=0.005765, diff=-0.6%, state=[6, 3, 0])
Range of particle indices to simulate with start state #9 out of 55: [6, 6] (n=1, n/N=0.0025, p=0.001255, diff=1.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #10 out of 55: [7, 7] (n=1, n/N=0.0025, p=0.000586, diff=3.3%, state=[6, 0, 3])
Range of particle indices to simulate with start state #11 out of 55: [8, 13] (n=6, n/N=0.015, p=0.010808, diff=0.4%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [14, 15] (n=2, n/N=0.005, p=0.005044, diff=-0.0%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [16, 17] (n=2, n/N=0.005, p=0.002354, diff=1.1%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [18, 18] (n=1, n/N=0.0025, p=0.001098, diff=1.3%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [19, 30] (n=12, n/N=0.03, p=0.020266, diff=0.5%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [31, 32] (n=2, n/N=0.005, p=0.009457, diff=-0.5%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [33, 34] (n=2, n/N=0.005, p=0.004413, diff=0.1%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [35, 35] (n=1, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [36, 37] (n=2, n/N=0.005, p=0.000961, diff=4.2%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [38, 51] (n=14, n/N=0.035, p=0.037998, diff=-0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [52, 62] (n=11, n/N=0.0275, p=0.017733, diff=0.6%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [63, 65] (n=3, n/N=0.0075, p=0.008275, diff=-0.1%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [66, 67] (n=2, n/N=0.005, p=0.003862, diff=0.3%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [68, 68] (n=1, n/N=0.0025, p=0.001802, diff=0.4%, state=[3, 2, 4])
Range of particle indices to simulate with start state #29 out of 55: [69, 100] (n=32, n/N=0.08, p=0.071247, diff=0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [101, 110] (n=10, n/N=0.025, p=0.033249, diff=-0.2%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [111, 112] (n=2, n/N=0.005, p=0.015516, diff=-0.7%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [113, 116] (n=4, n/N=0.01, p=0.007241, diff=0.4%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [117, 117] (n=1, n/N=0.0025, p=0.003379, diff=-0.3%, state=[2, 3, 4])
Range of particle indices to simulate with start state #37 out of 55: [118, 178] (n=61, n/N=0.1525, p=0.133588, diff=0.1%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [179, 200] (n=22, n/N=0.055, p=0.062341, diff=-0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [201, 208] (n=8, n/N=0.02, p=0.029093, diff=-0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [209, 211] (n=3, n/N=0.0075, p=0.013577, diff=-0.4%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [212, 215] (n=4, n/N=0.01, p=0.006336, diff=0.6%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [216, 216] (n=1, n/N=0.0025, p=0.002957, diff=-0.2%, state=[1, 3, 5])
Range of particle indices to simulate with start state #46 out of 55: [217, 302] (n=86, n/N=0.215, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [303, 361] (n=59, n/N=0.1475, p=0.116890, diff=0.3%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [362, 381] (n=20, n/N=0.05, p=0.054549, diff=-0.1%, state=[0, 7, 2])
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Range of particle indices to simulate with start state #49 out of 55: [382, 388] (n=7, n/N=0.0175, p=0.025456, diff=-0.3%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [389, 394] (n=6, n/N=0.015, p=0.011879, diff=0.3%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [395, 397] (n=3, n/N=0.0075, p=0.005544, diff=0.4%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [398, 398] (n=1, n/N=0.0025, p=0.002587, diff=-0.0%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [399, 399] (n=1, n/N=0.0025, p=0.001207, diff=1.1%, state=[0, 2, 7])
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=714.3 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: 767.6 sec, 12.8 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 #56 out of 66: [0, 0] (n=1, n/N=1.0, p=0.249761, diff=3.0%, state=[0, 10, 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=857142.9 or #events=978147)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=399.986, n=790
P=0: [<EventType.ABSORPTION: 0>] events at time 325724.8 removed.
P=0: Blocking time AFTER removal: t=399.986, n=790
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 25216 (38.0% of simulation time T=857142.9)
execution time: 720.7 sec, 12.0 min
execution time MC + FV: 1489.6 sec, 24.8 min
        P(K) by MC: 0.122799% (simulation time = 857142.9)
        P(K) estimated by FV: 0.044933%, E(T) = 22.6 (simulation time = 714.3)
        True P(K): 0.124693%
Results:
    K BSA    N replication    Pr(MC)       Time(MC) # Events(MC) # Cycles(MC)  \
1  20  10  400           1  0.001211  328141.173558       983157        24590
1  20  10  400           2  0.001244  325851.899986       978577        24863
1  20  10  400           3  0.001117  325867.913187       978275        25429
1  20  10  400           4  0.001453  324016.329477       972036        25393
1  20  10  400           5  0.001228  325724.727022       978147        25216

        E(T) # Cycles(E(T))    Pr(FV)       Time(FV) # Events(FV)  \
1  26.258834            400  0.000718  285714.285714       983157
1  24.544461            400  0.001412  285714.285714       978577
1  26.049454            400  0.002171  285714.285714       978275
1  20.584252            400  0.000540  285714.285714       972036
1  22.587029            400  0.000449  285714.285714       978147

  # Samples Surv     Pr(K)  seed    exec_time
1            400  0.001247  1719  1632.868600
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1            400  0.001247  1729  1497.139269
1            400  0.001247  1739  1507.700574
1            400  0.001247  1749  1483.316073
1            400  0.001247  1759  1489.610941

*** Running simulation for nparticles=800 (2 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #2 out of 55: [0, 0] (n=1, n/N=0.00125, p=0.001640, diff=-0.2%, state=[8, 1, 0])
Range of particle indices to simulate with start state #3 out of 55: [1, 1] (n=1, n/N=0.00125, p=0.000765, diff=0.6%, state=[8, 0, 1])
Range of particle indices to simulate with start state #4 out of 55: [2, 3] (n=2, n/N=0.0025, p=0.003074, diff=-0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [4, 4] (n=1, n/N=0.00125, p=0.001435, diff=-0.1%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [5, 5] (n=1, n/N=0.00125, p=0.005765, diff=-0.8%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [6, 7] (n=2, n/N=0.0025, p=0.002690, diff=-0.1%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [8, 8] (n=1, n/N=0.00125, p=0.001255, diff=-0.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [9, 14] (n=6, n/N=0.0075, p=0.010808, diff=-0.3%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [15, 16] (n=2, n/N=0.0025, p=0.005044, diff=-0.5%, state=[5, 3, 1])
Range of particle indices to simulate with start state #14 out of 55: [17, 19] (n=3, n/N=0.00375, p=0.001098, diff=2.4%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [20, 31] (n=12, n/N=0.015, p=0.020266, diff=-0.3%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [32, 37] (n=6, n/N=0.0075, p=0.009457, diff=-0.2%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [38, 41] (n=4, n/N=0.005, p=0.004413, diff=0.1%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [42, 42] (n=1, n/N=0.00125, p=0.002060, diff=-0.4%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [43, 44] (n=2, n/N=0.0025, p=0.000961, diff=1.6%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [45, 76] (n=32, n/N=0.04, p=0.037998, diff=0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [77, 91] (n=15, n/N=0.01875, p=0.017733, diff=0.1%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [92, 99] (n=8, n/N=0.01, p=0.008275, diff=0.2%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [100, 100] (n=1, n/N=0.00125, p=0.003862, diff=-0.7%, state=[3, 3, 3])
Range of particle indices to simulate with start state #27 out of 55: [101, 101] (n=1, n/N=0.00125, p=0.000841, diff=0.5%, state=[3, 1, 5])
Range of particle indices to simulate with start state #29 out of 55: [102, 153] (n=52, n/N=0.065, p=0.071247, diff=-0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [154, 185] (n=32, n/N=0.04, p=0.033249, diff=0.2%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [186, 199] (n=14, n/N=0.0175, p=0.015516, diff=0.1%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [200, 205] (n=6, n/N=0.0075, p=0.007241, diff=0.0%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [206, 206] (n=1, n/N=0.00125, p=0.003379, diff=-0.6%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [207, 208] (n=2, n/N=0.0025, p=0.001577, diff=0.6%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [209, 309] (n=101, n/N=0.12625, p=0.133588, diff=-0.1%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [310, 363] (n=54, n/N=0.0675, p=0.062341, diff=0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [364, 382] (n=19, n/N=0.02375, p=0.029093, diff=-0.2%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [383, 396] (n=14, n/N=0.0175, p=0.013577, diff=0.3%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [397, 402] (n=6, n/N=0.0075, p=0.006336, diff=0.2%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [403, 408] (n=6, n/N=0.0075, p=0.002957, diff=1.5%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [409, 409] (n=1, n/N=0.00125, p=0.001380, diff=-0.1%, state=[1, 2, 6])
Range of particle indices to simulate with start state #44 out of 55: [410, 410] (n=1, n/N=0.00125, p=0.000644, diff=0.9%, state=[1, 1, 7])
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Range of particle indices to simulate with start state #46 out of 55: [411, 598] (n=188, n/N=0.235, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [599, 708] (n=110, n/N=0.1375, p=0.116890, diff=0.2%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [709, 763] (n=55, n/N=0.06875, p=0.054549, diff=0.3%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [764, 786] (n=23, n/N=0.02875, p=0.025456, diff=0.1%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [787, 790] (n=4, n/N=0.005, p=0.011879, diff=-0.6%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [791, 796] (n=6, n/N=0.0075, p=0.005544, diff=0.4%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [797, 798] (n=2, n/N=0.0025, p=0.002587, diff=-0.0%, state=[0, 3, 6])
Range of particle indices to simulate with start state #55 out of 55: [799, 799] (n=1, n/N=0.00125, p=0.000263, diff=3.8%, state=[0, 0, 9])
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=714.3 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
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)
        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 1617.9 sec, 27.0 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 #46 out of 66: [0, 0] (n=1, n/N=1.0, p=0.133206, diff=6.5%, state=[1, 9, 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=1714285.7 or #events=1966368)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=846.574, n=1635
P=0: [<EventType.ABSORPTION: 0>] events at time 656134.2 removed.
P=0: Blocking time AFTER removal: t=846.574, n=1635
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 49637 (38.3% of simulation time T=1714285.7)
execution time: 1527.1 sec, 25.5 min
execution time MC + FV: 3146.3 sec, 52.4 min
        P(K) by MC: 0.129025% (simulation time = 1714285.7)
        P(K) estimated by FV: 0.128160%, E(T) = 27.0 (simulation time = 714.3)
        True P(K): 0.124693%




        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        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 55: [0, 0] (n=1, n/N=0.00125, p=0.000874, diff=0.4%, state=[9, 0, 0])
Range of particle indices to simulate with start state #2 out of 55: [1, 2] (n=2, n/N=0.0025, p=0.001640, diff=0.5%, state=[8, 1, 0])
```

```
Range of particle indices to simulate with start state #4 out of 55: [3, 8] (n=6, n/N=0.0075, p=0.003074, diff=1.4%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [9, 9] (n=1, n/N=0.00125, p=0.001435, diff=-0.1%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [10, 10] (n=1, n/N=0.00125, p=0.005765, diff=-0.8%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [11, 11] (n=1, n/N=0.00125, p=0.002690, diff=-0.5%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [12, 13] (n=2, n/N=0.0025, p=0.001255, diff=1.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [14, 21] (n=8, n/N=0.01, p=0.010808, diff=-0.1%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [22, 26] (n=5, n/N=0.00625, p=0.005044, diff=0.2%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [27, 31] (n=5, n/N=0.00625, p=0.002354, diff=1.7%, state=[5, 2, 2])
Range of particle indices to simulate with start state #16 out of 55: [32, 50] (n=19, n/N=0.02375, p=0.020266, diff=0.2%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [51, 63] (n=13, n/N=0.01625, p=0.009457, diff=0.7%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [64, 69] (n=6, n/N=0.0075, p=0.004413, diff=0.7%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [70, 72] (n=3, n/N=0.00375, p=0.002060, diff=0.8%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [73, 73] (n=1, n/N=0.00125, p=0.000961, diff=0.3%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [74, 94] (n=21, n/N=0.02625, p=0.037998, diff=-0.3%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [95, 101] (n=7, n/N=0.00875, p=0.017733, diff=-0.5%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [102, 109] (n=8, n/N=0.01, p=0.008275, diff=0.2%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [110, 113] (n=4, n/N=0.005, p=0.003862, diff=0.3%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [114, 115] (n=2, n/N=0.0025, p=0.001802, diff=0.4%, state=[3, 2, 4])
Range of particle indices to simulate with start state #29 out of 55: [116, 184] (n=69, n/N=0.08625, p=0.071247, diff=0.2%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [185, 212] (n=28, n/N=0.035, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [213, 228] (n=16, n/N=0.02, p=0.015516, diff=0.3%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [229, 235] (n=7, n/N=0.00875, p=0.007241, diff=0.2%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [236, 239] (n=4, n/N=0.005, p=0.003379, diff=0.5%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [240, 242] (n=3, n/N=0.00375, p=0.001577, diff=1.4%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [243, 345] (n=103, n/N=0.12875, p=0.133588, diff=-0.0%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [346, 389] (n=44, n/N=0.055, p=0.062341, diff=-0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [390, 419] (n=30, n/N=0.0375, p=0.029093, diff=0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [420, 434] (n=15, n/N=0.01875, p=0.013577, diff=0.4%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [435, 441] (n=7, n/N=0.00875, p=0.006336, diff=0.4%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [442, 444] (n=3, n/N=0.00375, p=0.002957, diff=0.3%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [445, 445] (n=1, n/N=0.00125, p=0.001380, diff=-0.1%, state=[1, 2, 6])
Range of particle indices to simulate with start state #44 out of 55: [446, 446] (n=1, n/N=0.00125, p=0.000644, diff=0.9%, state=[1, 1, 7])
Range of particle indices to simulate with start state #46 out of 55: [447, 634] (n=188, n/N=0.235, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [635, 734] (n=100, n/N=0.125, p=0.116890, diff=0.1%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [735, 770] (n=36, n/N=0.045, p=0.054549, diff=-0.2%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [771, 781] (n=11, n/N=0.01375, p=0.025456, diff=-0.5%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [782, 790] (n=9, n/N=0.01125, p=0.011879, diff=-0.1%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [791, 792] (n=2, n/N=0.0025, p=0.005544, diff=-0.5%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [793, 794] (n=2, n/N=0.0025, p=0.002587, diff=-0.0%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [795, 798] (n=4, n/N=0.005, p=0.001207, diff=3.1%, state=[0, 2, 7])
Range of particle indices to simulate with start state #54 out of 55: [799, 799] (n=1, n/N=0.00125, p=0.000563, diff=1.2%, state=[0, 1, 8])
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=714.3 or #events=inf)...
Finalizing and identifying measurement times...
Estimating blocking probability with Fleming-Viot...
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        --> Number of observations for P(T>t) estimation from FV simulation: 800 (N=800)
execution time: 1596.9 sec, 26.6 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 #37 out of 66: [0, 0] (n=1, n/N=1.0, p=0.071043, diff=13.1%, state=[2, 8, 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=1714285.7 or #events=1951968)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=836.946, n=1679
P=0: [<EventType.ABSORPTION: 0>] events at time 650072.6 removed.
P=0: Blocking time AFTER removal: t=836.946, n=1679
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 50692 (37.9% of simulation time T=1714285.7)
execution time: 1540.1 sec, 25.7 min
execution time MC + FV: 3139.7 sec, 52.3 min
        P(K) by MC: 0.128747% (simulation time = 1714285.7)
        P(K) estimated by FV: 0.115616%, E(T) = 19.3 (simulation time = 714.3)
        True P(K): 0.124693%




        Replication 3 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1737)...
Range of particle indices to simulate with start state #2 out of 55: [0, 3] (n=4, n/N=0.005, p=0.001640, diff=2.0%, state=[8, 1, 0])
Range of particle indices to simulate with start state #3 out of 55: [4, 5] (n=2, n/N=0.0025, p=0.000765, diff=2.3%, state=[8, 0, 1])
Range of particle indices to simulate with start state #4 out of 55: [6, 10] (n=5, n/N=0.00625, p=0.003074, diff=1.0%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [11, 12] (n=2, n/N=0.0025, p=0.001435, diff=0.7%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [13, 15] (n=3, n/N=0.00375, p=0.005765, diff=-0.3%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [16, 17] (n=2, n/N=0.0025, p=0.002690, diff=-0.1%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [18, 18] (n=1, n/N=0.00125, p=0.001255, diff=-0.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [19, 21] (n=3, n/N=0.00375, p=0.010808, diff=-0.7%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [22, 24] (n=3, n/N=0.00375, p=0.005044, diff=-0.3%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [25, 25] (n=1, n/N=0.00125, p=0.002354, diff=-0.5%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [26, 26] (n=1, n/N=0.00125, p=0.001098, diff=0.1%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [27, 40] (n=14, n/N=0.0175, p=0.020266, diff=-0.1%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [41, 45] (n=5, n/N=0.00625, p=0.009457, diff=-0.3%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [46, 48] (n=3, n/N=0.00375, p=0.004413, diff=-0.2%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [49, 52] (n=4, n/N=0.005, p=0.002060, diff=1.4%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [53, 53] (n=1, n/N=0.00125, p=0.000961, diff=0.3%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [54, 78] (n=25, n/N=0.03125, p=0.037998, diff=-0.2%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [79, 90] (n=12, n/N=0.015, p=0.017733, diff=-0.2%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [91, 93] (n=3, n/N=0.00375, p=0.008275, diff=-0.5%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [94, 96] (n=3, n/N=0.00375, p=0.003862, diff=-0.0%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [97, 97] (n=1, n/N=0.00125, p=0.001802, diff=-0.3%, state=[3, 2, 4])
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Range of particle indices to simulate with start state #29 out of 55: [98, 157] (n=60, n/N=0.075, p=0.071247, diff=0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [158, 185] (n=28, n/N=0.035, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [186, 202] (n=17, n/N=0.02125, p=0.015516, diff=0.4%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [203, 209] (n=7, n/N=0.00875, p=0.007241, diff=0.2%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [210, 213] (n=4, n/N=0.005, p=0.003379, diff=0.5%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [214, 217] (n=4, n/N=0.005, p=0.001577, diff=2.2%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [218, 323] (n=106, n/N=0.1325, p=0.133588, diff=-0.0%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [324, 376] (n=53, n/N=0.06625, p=0.062341, diff=0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [377, 404] (n=28, n/N=0.035, p=0.029093, diff=0.2%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [405, 415] (n=11, n/N=0.01375, p=0.013577, diff=0.0%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [416, 421] (n=6, n/N=0.0075, p=0.006336, diff=0.2%, state=[1, 4, 4])
Range of particle indices to simulate with start state #45 out of 55: [422, 423] (n=2, n/N=0.0025, p=0.000300, diff=7.3%, state=[1, 0, 8])
Range of particle indices to simulate with start state #46 out of 55: [424, 638] (n=215, n/N=0.26875, p=0.250478, diff=0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [639, 738] (n=100, n/N=0.125, p=0.116890, diff=0.1%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [739, 769] (n=31, n/N=0.03875, p=0.054549, diff=-0.3%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [770, 783] (n=14, n/N=0.0175, p=0.025456, diff=-0.3%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [784, 792] (n=9, n/N=0.01125, p=0.011879, diff=-0.1%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [793, 796] (n=4, n/N=0.005, p=0.005544, diff=-0.1%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [797, 798] (n=2, n/N=0.0025, p=0.002587, diff=-0.0%, state=[0, 3, 6])
Range of particle indices to simulate with start state #55 out of 55: [799, 799] (n=1, n/N=0.00125, p=0.000263, diff=3.8%, state=[0, 0, 9])
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=714.3 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: 1594.6 sec, 26.6 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 #56 out of 66: [0, 0] (n=1, n/N=1.0, p=0.249761, diff=3.0%, state=[0, 10, 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=1714285.7 or #events=1955136)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=855.087, n=1714
P=0: [<EventType.ABSORPTION: 0>] events at time 651085.0 removed.
P=0: Blocking time AFTER removal: t=855.087, n=1714
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 50504 (38.0% of simulation time T=1714285.7)
execution time: 1514.2 sec, 25.2 min
execution time MC + FV: 3112.0 sec, 51.9 min
        P(K) by MC: 0.131333% (simulation time = 1714285.7)
        P(K) estimated by FV: 0.105864%, E(T) = 22.3 (simulation time = 714.3)
        True P(K): 0.124693%
```

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        Replication 4 of 5...

        --> Running Fleming-Viot estimation...
        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 55: [0, 1] (n=2, n/N=0.0025, p=0.000874, diff=1.9%, state=[9, 0, 0])
Range of particle indices to simulate with start state #2 out of 55: [2, 2] (n=1, n/N=0.00125, p=0.001640, diff=-0.2%, state=[8, 1, 0])
Range of particle indices to simulate with start state #4 out of 55: [3, 4] (n=2, n/N=0.0025, p=0.003074, diff=-0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [5, 6] (n=2, n/N=0.0025, p=0.001435, diff=0.7%, state=[7, 1, 1])
Range of particle indices to simulate with start state #6 out of 55: [7, 8] (n=2, n/N=0.0025, p=0.000670, diff=2.7%, state=[7, 0, 2])
Range of particle indices to simulate with start state #7 out of 55: [9, 16] (n=8, n/N=0.01, p=0.005765, diff=0.7%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [17, 17] (n=1, n/N=0.00125, p=0.002690, diff=-0.5%, state=[6, 2, 1])
Range of particle indices to simulate with start state #11 out of 55: [18, 29] (n=12, n/N=0.015, p=0.010808, diff=0.4%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [30, 30] (n=1, n/N=0.00125, p=0.005044, diff=-0.8%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [31, 31] (n=1, n/N=0.00125, p=0.002354, diff=-0.5%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [32, 32] (n=1, n/N=0.00125, p=0.001098, diff=0.1%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [33, 41] (n=9, n/N=0.01125, p=0.020266, diff=-0.4%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [42, 51] (n=10, n/N=0.0125, p=0.009457, diff=0.3%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [52, 53] (n=2, n/N=0.0025, p=0.004413, diff=-0.4%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [54, 54] (n=1, n/N=0.00125, p=0.002060, diff=-0.4%, state=[4, 2, 3])
Range of particle indices to simulate with start state #21 out of 55: [55, 55] (n=1, n/N=0.00125, p=0.000449, diff=1.8%, state=[4, 0, 5])
Range of particle indices to simulate with start state #22 out of 55: [56, 87] (n=32, n/N=0.04, p=0.037998, diff=0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [88, 97] (n=10, n/N=0.0125, p=0.017733, diff=-0.3%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [98, 104] (n=7, n/N=0.00875, p=0.008275, diff=0.1%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [105, 109] (n=5, n/N=0.00625, p=0.003862, diff=0.6%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [110, 110] (n=1, n/N=0.00125, p=0.001802, diff=-0.3%, state=[3, 2, 4])
Range of particle indices to simulate with start state #27 out of 55: [111, 112] (n=2, n/N=0.0025, p=0.000841, diff=2.0%, state=[3, 1, 5])
Range of particle indices to simulate with start state #28 out of 55: [113, 113] (n=1, n/N=0.00125, p=0.000392, diff=2.2%, state=[3, 0, 6])
Range of particle indices to simulate with start state #29 out of 55: [114, 177] (n=64, n/N=0.08, p=0.071247, diff=0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [178, 206] (n=29, n/N=0.03625, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [207, 212] (n=6, n/N=0.0075, p=0.015516, diff=-0.5%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [213, 218] (n=6, n/N=0.0075, p=0.007241, diff=0.0%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [219, 222] (n=4, n/N=0.005, p=0.003379, diff=0.5%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [223, 225] (n=3, n/N=0.00375, p=0.001577, diff=1.4%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [226, 355] (n=130, n/N=0.1625, p=0.133588, diff=0.2%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [356, 411] (n=56, n/N=0.07, p=0.062341, diff=0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [412, 428] (n=17, n/N=0.02125, p=0.029093, diff=-0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [429, 437] (n=9, n/N=0.01125, p=0.013577, diff=-0.2%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [438, 440] (n=3, n/N=0.00375, p=0.006336, diff=-0.4%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [441, 443] (n=3, n/N=0.00375, p=0.002957, diff=0.3%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [444, 444] (n=1, n/N=0.00125, p=0.001380, diff=-0.1%, state=[1, 2, 6])
Range of particle indices to simulate with start state #44 out of 55: [445, 445] (n=1, n/N=0.00125, p=0.000644, diff=0.9%, state=[1, 1, 7])
Range of particle indices to simulate with start state #45 out of 55: [446, 446] (n=1, n/N=0.00125, p=0.000300, diff=3.2%, state=[1, 0, 8])
Range of particle indices to simulate with start state #46 out of 55: [447, 631] (n=185, n/N=0.23125, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [632, 720] (n=89, n/N=0.11125, p=0.116890, diff=-0.0%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [721, 765] (n=45, n/N=0.05625, p=0.054549, diff=0.0%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [766, 780] (n=15, n/N=0.01875, p=0.025456, diff=-0.3%, state=[0, 6, 3])
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Range of particle indices to simulate with start state #50 out of 55: [781, 788] (n=8, n/N=0.01, p=0.011879, diff=-0.2%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [789, 795] (n=7, n/N=0.00875, p=0.005544, diff=0.6%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [796, 798] (n=3, n/N=0.00375, p=0.002587, diff=0.4%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [799, 799] (n=1, n/N=0.00125, p=0.001207, diff=0.0%, state=[0, 2, 7])
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=714.3 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: 1605.3 sec, 26.8 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 #48 out of 66: [0, 0] (n=1, n/N=1.0, p=0.029009, diff=33.5%, state=[1, 7, 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=1714285.7 or #events=1958104)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=835.812, n=1686
P=0: [<EventType.ABSORPTION: 0>] events at time 653000.6 removed.
P=0: Blocking time AFTER removal: t=835.812, n=1686
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 51026 (38.1% of simulation time T=1714285.7)
execution time: 1507.5 sec, 25.1 min
execution time MC + FV: 3115.8 sec, 51.9 min
        P(K) by MC: 0.127996% (simulation time = 1714285.7)
        P(K) estimated by FV: 0.204734%, E(T) = 23.6 (simulation time = 714.3)
        True P(K): 0.124693%




        Replication 5 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1757)...
Range of particle indices to simulate with start state #2 out of 55: [0, 0] (n=1, n/N=0.00125, p=0.001640, diff=-0.2%, state=[8, 1, 0])
Range of particle indices to simulate with start state #3 out of 55: [1, 1] (n=1, n/N=0.00125, p=0.000765, diff=0.6%, state=[8, 0, 1])
Range of particle indices to simulate with start state #4 out of 55: [2, 4] (n=3, n/N=0.00375, p=0.003074, diff=0.2%, state=[7, 2, 0])
Range of particle indices to simulate with start state #6 out of 55: [5, 5] (n=1, n/N=0.00125, p=0.000670, diff=0.9%, state=[7, 0, 2])
Range of particle indices to simulate with start state #7 out of 55: [6, 9] (n=4, n/N=0.005, p=0.005765, diff=-0.1%, state=[6, 3, 0])
Range of particle indices to simulate with start state #9 out of 55: [10, 12] (n=3, n/N=0.00375, p=0.001255, diff=2.0%, state=[6, 1, 2])
Range of particle indices to simulate with start state #10 out of 55: [13, 13] (n=1, n/N=0.00125, p=0.000586, diff=1.1%, state=[6, 0, 3])
Range of particle indices to simulate with start state #11 out of 55: [14, 23] (n=10, n/N=0.0125, p=0.010808, diff=0.2%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [24, 28] (n=5, n/N=0.00625, p=0.005044, diff=0.2%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [29, 31] (n=3, n/N=0.00375, p=0.002354, diff=0.6%, state=[5, 2, 2])
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Range of particle indices to simulate with start state #14 out of 55: [32, 32] (n=1, n/N=0.00125, p=0.001098, diff=0.1%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [33, 50] (n=18, n/N=0.0225, p=0.020266, diff=0.1%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [51, 56] (n=6, n/N=0.0075, p=0.009457, diff=-0.2%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [57, 61] (n=5, n/N=0.00625, p=0.004413, diff=0.4%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [62, 63] (n=2, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [64, 65] (n=2, n/N=0.0025, p=0.000961, diff=1.6%, state=[4, 1, 4])
Range of particle indices to simulate with start state #22 out of 55: [66, 93] (n=28, n/N=0.035, p=0.037998, diff=-0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [94, 112] (n=19, n/N=0.02375, p=0.017733, diff=0.3%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [113, 119] (n=7, n/N=0.00875, p=0.008275, diff=0.1%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [120, 122] (n=3, n/N=0.00375, p=0.003862, diff=-0.0%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [123, 123] (n=1, n/N=0.00125, p=0.001802, diff=-0.3%, state=[3, 2, 4])
Range of particle indices to simulate with start state #29 out of 55: [124, 177] (n=54, n/N=0.0675, p=0.071247, diff=-0.1%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [178, 205] (n=28, n/N=0.035, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [206, 213] (n=8, n/N=0.01, p=0.015516, diff=-0.4%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [214, 221] (n=8, n/N=0.01, p=0.007241, diff=0.4%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [222, 223] (n=2, n/N=0.0025, p=0.003379, diff=-0.3%, state=[2, 3, 4])
Range of particle indices to simulate with start state #35 out of 55: [224, 224] (n=1, n/N=0.00125, p=0.000736, diff=0.7%, state=[2, 1, 6])
Range of particle indices to simulate with start state #37 out of 55: [225, 335] (n=111, n/N=0.13875, p=0.133588, diff=0.0%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [336, 379] (n=44, n/N=0.055, p=0.062341, diff=-0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [380, 396] (n=17, n/N=0.02125, p=0.029093, diff=-0.3%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [397, 407] (n=11, n/N=0.01375, p=0.013577, diff=0.0%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [408, 413] (n=6, n/N=0.0075, p=0.006336, diff=0.2%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [414, 415] (n=2, n/N=0.0025, p=0.002957, diff=-0.2%, state=[1, 3, 5])
Range of particle indices to simulate with start state #44 out of 55: [416, 416] (n=1, n/N=0.00125, p=0.000644, diff=0.9%, state=[1, 1, 7])
Range of particle indices to simulate with start state #45 out of 55: [417, 417] (n=1, n/N=0.00125, p=0.000300, diff=3.2%, state=[1, 0, 8])
Range of particle indices to simulate with start state #46 out of 55: [418, 609] (n=192, n/N=0.24, p=0.250478, diff=-0.0%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [610, 719] (n=110, n/N=0.1375, p=0.116890, diff=0.2%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [720, 757] (n=38, n/N=0.0475, p=0.054549, diff=-0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [758, 773] (n=16, n/N=0.02, p=0.025456, diff=-0.2%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [774, 786] (n=13, n/N=0.01625, p=0.011879, diff=0.4%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [787, 793] (n=7, n/N=0.00875, p=0.005544, diff=0.6%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [794, 796] (n=3, n/N=0.00375, p=0.002587, diff=0.4%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [797, 799] (n=3, n/N=0.00375, p=0.001207, diff=2.1%, state=[0, 2, 7])
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=714.3 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: 1593.7 sec, 26.6 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 #56 out of 66: [0, 0] (n=1, n/N=1.0, p=0.249761, diff=3.0%, state=[0, 10, 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=1714285.7 or #events=1963502)...
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Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=850.135, n=1700
P=0: [<EventType.ABSORPTION: 0>] events at time 654148.8 removed.
P=0: Blocking time AFTER removal: t=850.135, n=1700
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 49470 (38.2% of simulation time T=1714285.7)
execution time: 1496.5 sec, 24.9 min
execution time MC + FV: 3092.8 sec, 51.5 min
        P(K) by MC: 0.129960% (simulation time = 1714285.7)
        P(K) estimated by FV: 0.219112%, E(T) = 23.6 (simulation time = 714.3)
        True P(K): 0.124693%
Results:
    K BSA    N replication    Pr(MC)       Time(MC) # Events(MC) # Cycles(MC)  \
1  20  10  400           1  0.001211  328141.173558       983157        24590
1  20  10  400           2  0.001244  325851.899986       978577        24863
1  20  10  400           3  0.001117  325867.913187       978275        25429
1  20  10  400           4  0.001453  324016.329477       972036        25393
1  20  10  400           5  0.001228  325724.727022       978147        25216
2  20  10  800           1  0.001290  656133.796714      1966368        49637
2  20  10  800           2  0.001287  650072.320710      1951968        50692
2  20  10  800           3  0.001313  651084.581825      1955136        50504
2  20  10  800           4  0.001280  653000.253608      1958104        51026
2  20  10  800           5  0.001300  654148.532377      1963502        49470

        E(T) # Cycles(E(T))    Pr(FV)       Time(FV) # Events(FV)  \
1  26.258834            400  0.000718  285714.285714       983157
1  24.544461            400  0.001412  285714.285714       978577
1  26.049454            400  0.002171  285714.285714       978275
1  20.584252            400  0.000540  285714.285714       972036
1  22.587029            400  0.000449  285714.285714       978147
2  27.005450            800  0.001282  571428.571429      1966368
2  19.349492            800  0.001156  571428.571429      1951968
2  22.333347            800  0.001059  571428.571429      1955136
2  23.566375            800  0.002047  571428.571429      1958104
2  23.571401            800  0.002191  571428.571429      1963502

  # Samples Surv     Pr(K)  seed    exec_time
1            400  0.001247  1719  1632.868600
1            400  0.001247  1729  1497.139269
1            400  0.001247  1739  1507.700574
1            400  0.001247  1749  1483.316073
1            400  0.001247  1759  1489.610941
2            800  0.001247  1719  3146.275716
2            800  0.001247  1729  3139.707499
2            800  0.001247  1739  3111.961202
2            800  0.001247  1749  3115.772636
2            800  0.001247  1759  3092.834640
```

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*** Running simulation for nparticles=1600 (3 of 3) on 5 replications...



        Replication 1 of 5...

        --> Running Fleming-Viot estimation...
        Running Fleming-Viot simulation using an ABSORPTION start state to estimate blocking probability (seed=1717)...
Range of particle indices to simulate with start state #2 out of 55: [0, 4] (n=5, n/N=0.003125, p=0.001640, diff=0.9%, state=[8, 1, 0])
Range of particle indices to simulate with start state #3 out of 55: [5, 5] (n=1, n/N=0.000625, p=0.000765, diff=-0.2%, state=[8, 0, 1])
Range of particle indices to simulate with start state #4 out of 55: [6, 10] (n=5, n/N=0.003125, p=0.003074, diff=0.0%, state=[7, 2, 0])
Range of particle indices to simulate with start state #5 out of 55: [11, 12] (n=2, n/N=0.00125, p=0.001435, diff=-0.1%, state=[7, 1, 1])
Range of particle indices to simulate with start state #7 out of 55: [13, 17] (n=5, n/N=0.003125, p=0.005765, diff=-0.5%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [18, 24] (n=7, n/N=0.004375, p=0.002690, diff=0.6%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [25, 25] (n=1, n/N=0.000625, p=0.001255, diff=-0.5%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [26, 41] (n=16, n/N=0.01, p=0.010808, diff=-0.1%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [42, 46] (n=5, n/N=0.003125, p=0.005044, diff=-0.4%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [47, 47] (n=1, n/N=0.000625, p=0.002354, diff=-0.7%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [48, 51] (n=4, n/N=0.0025, p=0.001098, diff=1.3%, state=[5, 1, 3])
Range of particle indices to simulate with start state #16 out of 55: [52, 76] (n=25, n/N=0.015625, p=0.020266, diff=-0.2%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [77, 89] (n=13, n/N=0.008125, p=0.009457, diff=-0.1%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [90, 95] (n=6, n/N=0.00375, p=0.004413, diff=-0.2%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [96, 99] (n=4, n/N=0.0025, p=0.002060, diff=0.2%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [100, 102] (n=3, n/N=0.001875, p=0.000961, diff=1.0%, state=[4, 1, 4])
Range of particle indices to simulate with start state #21 out of 55: [103, 103] (n=1, n/N=0.000625, p=0.000449, diff=0.4%, state=[4, 0, 5])
Range of particle indices to simulate with start state #22 out of 55: [104, 157] (n=54, n/N=0.03375, p=0.037998, diff=-0.1%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [158, 180] (n=23, n/N=0.014375, p=0.017733, diff=-0.2%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [181, 195] (n=15, n/N=0.009375, p=0.008275, diff=0.1%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [196, 201] (n=6, n/N=0.00375, p=0.003862, diff=-0.0%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [202, 202] (n=1, n/N=0.000625, p=0.001802, diff=-0.7%, state=[3, 2, 4])
Range of particle indices to simulate with start state #27 out of 55: [203, 203] (n=1, n/N=0.000625, p=0.000841, diff=-0.3%, state=[3, 1, 5])
Range of particle indices to simulate with start state #28 out of 55: [204, 204] (n=1, n/N=0.000625, p=0.000392, diff=0.6%, state=[3, 0, 6])
Range of particle indices to simulate with start state #29 out of 55: [205, 321] (n=117, n/N=0.073125, p=0.071247, diff=0.0%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [322, 374] (n=53, n/N=0.033125, p=0.033249, diff=-0.0%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [375, 401] (n=27, n/N=0.016875, p=0.015516, diff=0.1%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [402, 409] (n=8, n/N=0.005, p=0.007241, diff=-0.3%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [410, 413] (n=4, n/N=0.0025, p=0.003379, diff=-0.3%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [414, 415] (n=2, n/N=0.00125, p=0.001577, diff=-0.2%, state=[2, 2, 5])
Range of particle indices to simulate with start state #35 out of 55: [416, 417] (n=2, n/N=0.00125, p=0.000736, diff=0.7%, state=[2, 1, 6])
Range of particle indices to simulate with start state #37 out of 55: [418, 630] (n=213, n/N=0.133125, p=0.133588, diff=-0.0%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [631, 737] (n=107, n/N=0.066875, p=0.062341, diff=0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [738, 777] (n=40, n/N=0.025, p=0.029093, diff=-0.1%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [778, 804] (n=27, n/N=0.016875, p=0.013577, diff=0.2%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [805, 812] (n=8, n/N=0.005, p=0.006336, diff=-0.2%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [813, 823] (n=11, n/N=0.006875, p=0.002957, diff=1.3%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [824, 826] (n=3, n/N=0.001875, p=0.001380, diff=0.4%, state=[1, 2, 6])
Range of particle indices to simulate with start state #44 out of 55: [827, 827] (n=1, n/N=0.000625, p=0.000644, diff=-0.0%, state=[1, 1, 7])
```

```
Range of particle indices to simulate with start state #46 out of 55: [828, 1212] (n=385, n/N=0.240625, p=0.250478, diff=-0.0%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [1213, 1416] (n=204, n/N=0.1275, p=0.116890, diff=0.1%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [1417, 1515] (n=99, n/N=0.061875, p=0.054549, diff=0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [1516, 1558] (n=43, n/N=0.026875, p=0.025456, diff=0.1%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [1559, 1578] (n=20, n/N=0.0125, p=0.011879, diff=0.1%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [1579, 1588] (n=10, n/N=0.00625, p=0.005544, diff=0.1%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [1589, 1594] (n=6, n/N=0.00375, p=0.002587, diff=0.4%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [1595, 1596] (n=2, n/N=0.00125, p=0.001207, diff=0.0%, state=[0, 2, 7])
Range of particle indices to simulate with start state #54 out of 55: [1597, 1598] (n=2, n/N=0.00125, p=0.000563, diff=1.2%, state=[0, 1, 8])
Range of particle indices to simulate with start state #55 out of 55: [1599, 1599] (n=1, n/N=0.000625, p=0.000263, diff=1.4%, state=[0, 0, 9])
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=714.3 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: 1600 (N=1600)
execution time: 3435.3 sec, 57.3 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 #46 out of 66: [0, 0] (n=1, n/N=1.0, p=0.133206, diff=6.5%, state=[1, 9, 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=3428571.4 or #events=3912162)...
Finalizing and identifying measurement times...
P=0: Blocking time BEFORE removal: t=1636.160, n=3240
P=0: [<EventType.ABSORPTION: 0>] events at time 1304441.7 removed.
P=0: Blocking time AFTER removal: t=1636.160, n=3240
Estimating blocking probability with Monte-Carlo...
        --> Number of observations for Pr(K) estimation: 100421 (38.0% of simulation time T=3428571.4)
execution time: 3364.9 sec, 56.1 min
execution time MC + FV: 6803.1 sec, 113.4 min
        P(K) by MC: 0.125430% (simulation time = 3428571.4)
        P(K) estimated by FV: 0.075902%, E(T) = 23.5 (simulation time = 714.3)
        True P(K): 0.124693%




        Replication 2 of 5...

        --> Running Fleming-Viot estimation...
        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 55: [0, 1] (n=2, n/N=0.00125, p=0.000874, diff=0.4%, state=[9, 0, 0])
Range of particle indices to simulate with start state #2 out of 55: [2, 4] (n=3, n/N=0.001875, p=0.001640, diff=0.1%, state=[8, 1, 0])
Range of particle indices to simulate with start state #3 out of 55: [5, 6] (n=2, n/N=0.00125, p=0.000765, diff=0.6%, state=[8, 0, 1])
Range of particle indices to simulate with start state #4 out of 55: [7, 16] (n=10, n/N=0.00625, p=0.003074, diff=1.0%, state=[7, 2, 0])
```

```
Range of particle indices to simulate with start state #5 out of 55: [17, 18] (n=2, n/N=0.00125, p=0.001435, diff=-0.1%, state=[7, 1, 1])
Range of particle indices to simulate with start state #6 out of 55: [19, 19] (n=1, n/N=0.000625, p=0.000670, diff=-0.1%, state=[7, 0, 2])
Range of particle indices to simulate with start state #7 out of 55: [20, 27] (n=8, n/N=0.005, p=0.005765, diff=-0.1%, state=[6, 3, 0])
Range of particle indices to simulate with start state #8 out of 55: [28, 29] (n=2, n/N=0.00125, p=0.002690, diff=-0.5%, state=[6, 2, 1])
Range of particle indices to simulate with start state #9 out of 55: [30, 32] (n=3, n/N=0.001875, p=0.001255, diff=0.5%, state=[6, 1, 2])
Range of particle indices to simulate with start state #11 out of 55: [33, 51] (n=19, n/N=0.011875, p=0.010808, diff=0.1%, state=[5, 4, 0])
Range of particle indices to simulate with start state #12 out of 55: [52, 58] (n=7, n/N=0.004375, p=0.005044, diff=-0.1%, state=[5, 3, 1])
Range of particle indices to simulate with start state #13 out of 55: [59, 64] (n=6, n/N=0.00375, p=0.002354, diff=0.6%, state=[5, 2, 2])
Range of particle indices to simulate with start state #14 out of 55: [65, 66] (n=2, n/N=0.00125, p=0.001098, diff=0.1%, state=[5, 1, 3])
Range of particle indices to simulate with start state #15 out of 55: [67, 68] (n=2, n/N=0.00125, p=0.000513, diff=1.4%, state=[5, 0, 4])
Range of particle indices to simulate with start state #16 out of 55: [69, 108] (n=40, n/N=0.025, p=0.020266, diff=0.2%, state=[4, 5, 0])
Range of particle indices to simulate with start state #17 out of 55: [109, 127] (n=19, n/N=0.011875, p=0.009457, diff=0.3%, state=[4, 4, 1])
Range of particle indices to simulate with start state #18 out of 55: [128, 134] (n=7, n/N=0.004375, p=0.004413, diff=-0.0%, state=[4, 3, 2])
Range of particle indices to simulate with start state #19 out of 55: [135, 141] (n=7, n/N=0.004375, p=0.002060, diff=1.1%, state=[4, 2, 3])
Range of particle indices to simulate with start state #20 out of 55: [142, 142] (n=1, n/N=0.000625, p=0.000961, diff=-0.3%, state=[4, 1, 4])
Range of particle indices to simulate with start state #21 out of 55: [143, 143] (n=1, n/N=0.000625, p=0.000449, diff=0.4%, state=[4, 0, 5])
Range of particle indices to simulate with start state #22 out of 55: [144, 190] (n=47, n/N=0.029375, p=0.037998, diff=-0.2%, state=[3, 6, 0])
Range of particle indices to simulate with start state #23 out of 55: [191, 212] (n=22, n/N=0.01375, p=0.017733, diff=-0.2%, state=[3, 5, 1])
Range of particle indices to simulate with start state #24 out of 55: [213, 229] (n=17, n/N=0.010625, p=0.008275, diff=0.3%, state=[3, 4, 2])
Range of particle indices to simulate with start state #25 out of 55: [230, 235] (n=6, n/N=0.00375, p=0.003862, diff=-0.0%, state=[3, 3, 3])
Range of particle indices to simulate with start state #26 out of 55: [236, 238] (n=3, n/N=0.001875, p=0.001802, diff=0.0%, state=[3, 2, 4])
Range of particle indices to simulate with start state #27 out of 55: [239, 241] (n=3, n/N=0.001875, p=0.000841, diff=1.2%, state=[3, 1, 5])
Range of particle indices to simulate with start state #29 out of 55: [242, 383] (n=142, n/N=0.08875, p=0.071247, diff=0.2%, state=[2, 7, 0])
Range of particle indices to simulate with start state #30 out of 55: [384, 443] (n=60, n/N=0.0375, p=0.033249, diff=0.1%, state=[2, 6, 1])
Range of particle indices to simulate with start state #31 out of 55: [444, 473] (n=30, n/N=0.01875, p=0.015516, diff=0.2%, state=[2, 5, 2])
Range of particle indices to simulate with start state #32 out of 55: [474, 484] (n=11, n/N=0.006875, p=0.007241, diff=-0.1%, state=[2, 4, 3])
Range of particle indices to simulate with start state #33 out of 55: [485, 489] (n=5, n/N=0.003125, p=0.003379, diff=-0.1%, state=[2, 3, 4])
Range of particle indices to simulate with start state #34 out of 55: [490, 493] (n=4, n/N=0.0025, p=0.001577, diff=0.6%, state=[2, 2, 5])
Range of particle indices to simulate with start state #37 out of 55: [494, 695] (n=202, n/N=0.12625, p=0.133588, diff=-0.1%, state=[1, 8, 0])
Range of particle indices to simulate with start state #38 out of 55: [696, 789] (n=94, n/N=0.05875, p=0.062341, diff=-0.1%, state=[1, 7, 1])
Range of particle indices to simulate with start state #39 out of 55: [790, 838] (n=49, n/N=0.030625, p=0.029093, diff=0.1%, state=[1, 6, 2])
Range of particle indices to simulate with start state #40 out of 55: [839, 866] (n=28, n/N=0.0175, p=0.013577, diff=0.3%, state=[1, 5, 3])
Range of particle indices to simulate with start state #41 out of 55: [867, 879] (n=13, n/N=0.008125, p=0.006336, diff=0.3%, state=[1, 4, 4])
Range of particle indices to simulate with start state #42 out of 55: [880, 883] (n=4, n/N=0.0025, p=0.002957, diff=-0.2%, state=[1, 3, 5])
Range of particle indices to simulate with start state #43 out of 55: [884, 886] (n=3, n/N=0.001875, p=0.001380, diff=0.4%, state=[1, 2, 6])
Range of particle indices to simulate with start state #44 out of 55: [887, 887] (n=1, n/N=0.000625, p=0.000644, diff=-0.0%, state=[1, 1, 7])
Range of particle indices to simulate with start state #46 out of 55: [888, 1258] (n=371, n/N=0.231875, p=0.250478, diff=-0.1%, state=[0, 9, 0])
Range of particle indices to simulate with start state #47 out of 55: [1259, 1454] (n=196, n/N=0.1225, p=0.116890, diff=0.0%, state=[0, 8, 1])
Range of particle indices to simulate with start state #48 out of 55: [1455, 1536] (n=82, n/N=0.05125, p=0.054549, diff=-0.1%, state=[0, 7, 2])
Range of particle indices to simulate with start state #49 out of 55: [1537, 1567] (n=31, n/N=0.019375, p=0.025456, diff=-0.2%, state=[0, 6, 3])
Range of particle indices to simulate with start state #50 out of 55: [1568, 1579] (n=12, n/N=0.0075, p=0.011879, diff=-0.4%, state=[0, 5, 4])
Range of particle indices to simulate with start state #51 out of 55: [1580, 1589] (n=10, n/N=0.00625, p=0.005544, diff=0.1%, state=[0, 4, 5])
Range of particle indices to simulate with start state #52 out of 55: [1590, 1592] (n=3, n/N=0.001875, p=0.002587, diff=-0.3%, state=[0, 3, 6])
Range of particle indices to simulate with start state #53 out of 55: [1593, 1597] (n=5, n/N=0.003125, p=0.001207, diff=1.6%, state=[0, 2, 7])
Range of particle indices to simulate with start state #54 out of 55: [1598, 1598] (n=1, n/N=0.000625, p=0.000563, diff=0.1%, state=[0, 1, 8])
Range of particle indices to simulate with start state #55 out of 55: [1599, 1599] (n=1, n/N=0.000625, p=0.000263, diff=1.4%, state=[0, 0, 9])
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=714.3 or #events=inf)...
Traceback (most recent call last):

  File "<ipython-input-1-cc767213348a>", line 1, in <module>
    runfile('E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test/test_QB.py', wdir='E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test')

  File "C:\ProgramData\Anaconda\Anaconda3\lib\site-packages\spyder\utils\site\sitecustomize.py", line 705, in runfile
    execfile(filename, namespace)

  File "C:\ProgramData\Anaconda\Anaconda3\lib\site-packages\spyder\utils\site\sitecustomize.py", line 102, in execfile
    exec(compile(f.read(), filename, 'exec'), namespace)

  File "E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test/test_QB.py", line 1722, in <module>
    #results, results_agg, est_mc, est_fv, est_abs, est_surv, ax_mc, ax_fv = Test_QB_Particles.test_fv_implementation(nservers=3, K=20,
buffer_size_activation=0.5, burnin_cycles_absorption=1)

  File "E:/Daniel/Projects/PhD-RL-Toulouse/projects/Python/test/test_QB.py", line 552, in test_fv_implementation
    est_fv, est_abs, est_surv, dict_stats_fv = estimators.estimate_blocking_fv(env_queue, dict_params_simul, dict_params_info=dict_params_info)

  File "E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\lib\estimators.py", line 4567, in estimate_blocking_fv
    proba_blocking_fv, integral, expected_survival_time, n_expected_survival_time = est_fv.simulate(EventType.ABSORPTION)

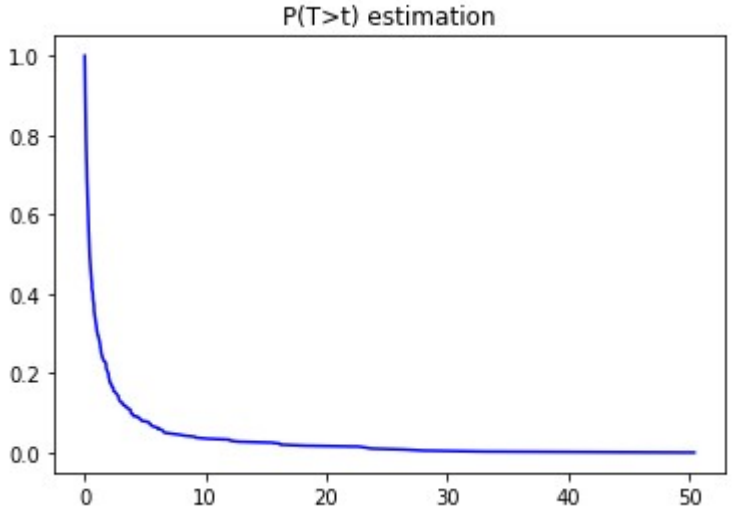
  File "E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\lib\estimators.py", line 880, in simulate
    time_start, time1, time2, time3 = self.run_simulation()

  File "E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\lib\estimators.py", line 1003, in run_simulation
    self.generate_trajectories_until_end_of_simulation()

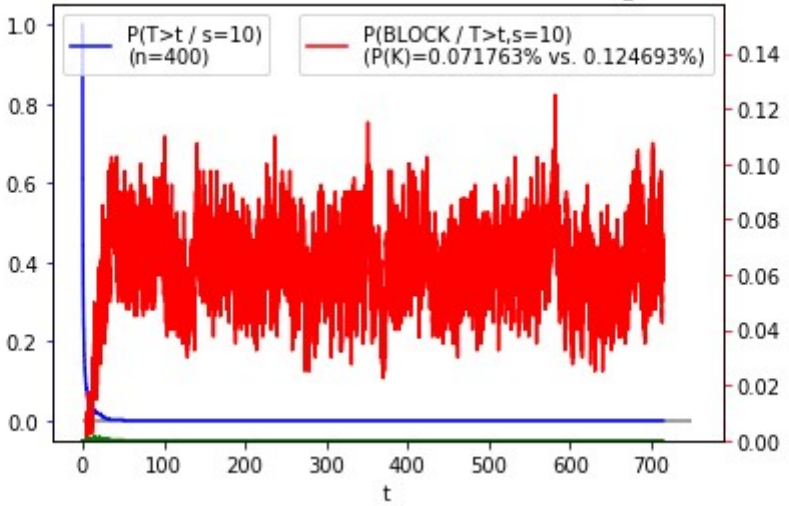
  File "E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\lib\estimators.py", line 1855, in generate_trajectories_until_end_of_simulation
    self._reset_birth_and_death_times(P)    # NOTE: This reset is done because conceptually a reactivated particle is like a re-born particle, so the
simulation should start from scratch.

  File "E:\Daniel\Projects\PhD-RL-Toulouse\projects\Python\lib\estimators.py", line 2036, in _reset_birth_and_death_times
    self.times_next_events2 = np.zeros((self.N, self.nservers, 2), dtype=float) # `2` is the number of possible events: birth and death

KeyboardInterrupt
```



K=20, rhos=[0.4, 0.75, 0.35], N=400, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=26.3(n=400), finalize=ABS, seed=1717



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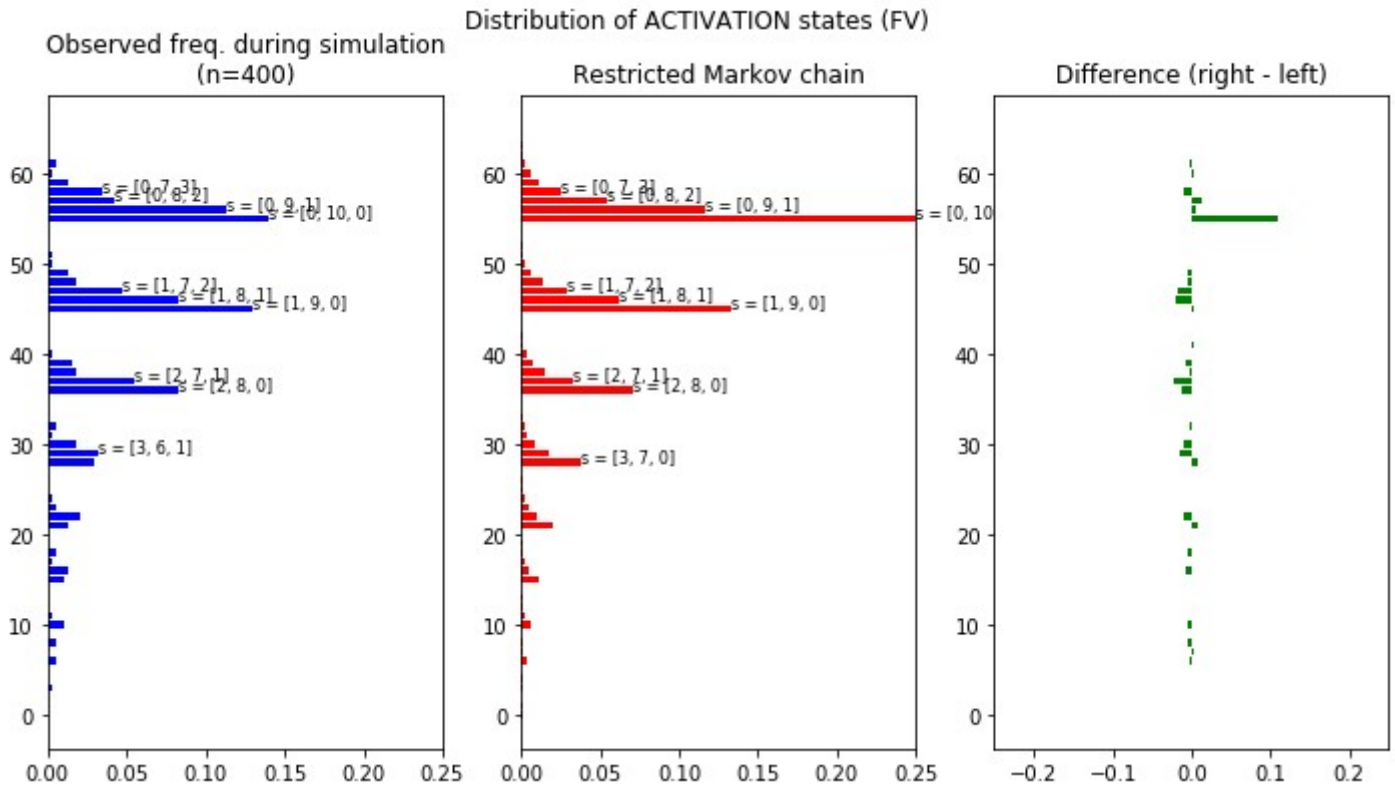
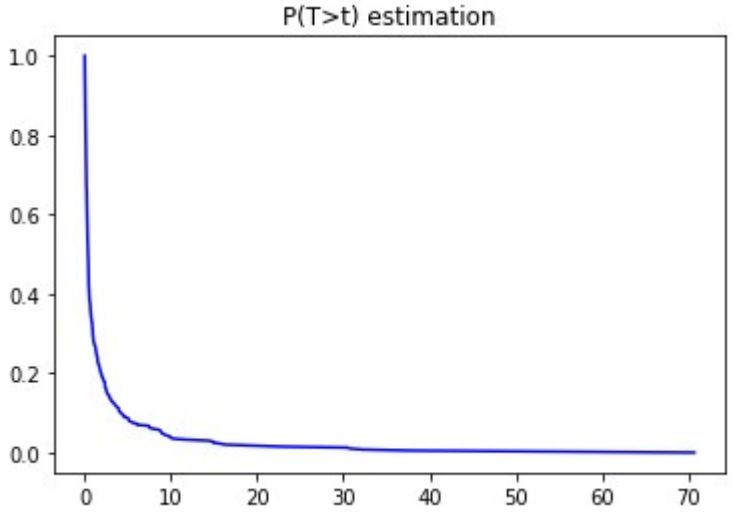
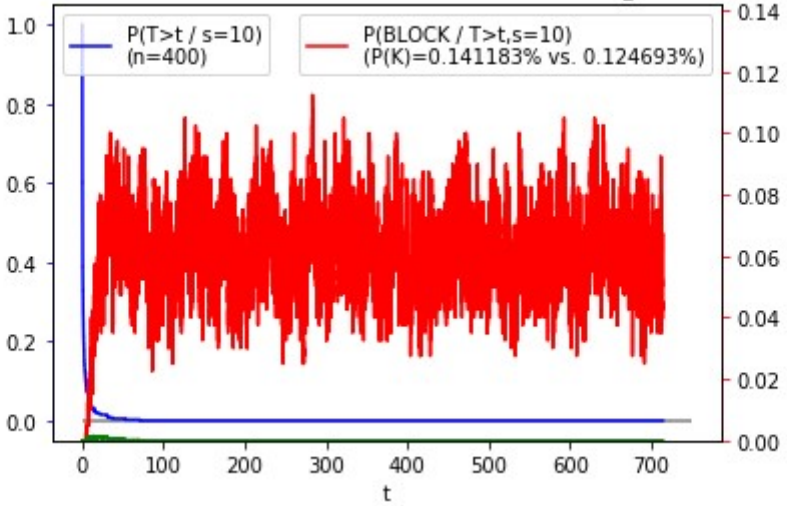
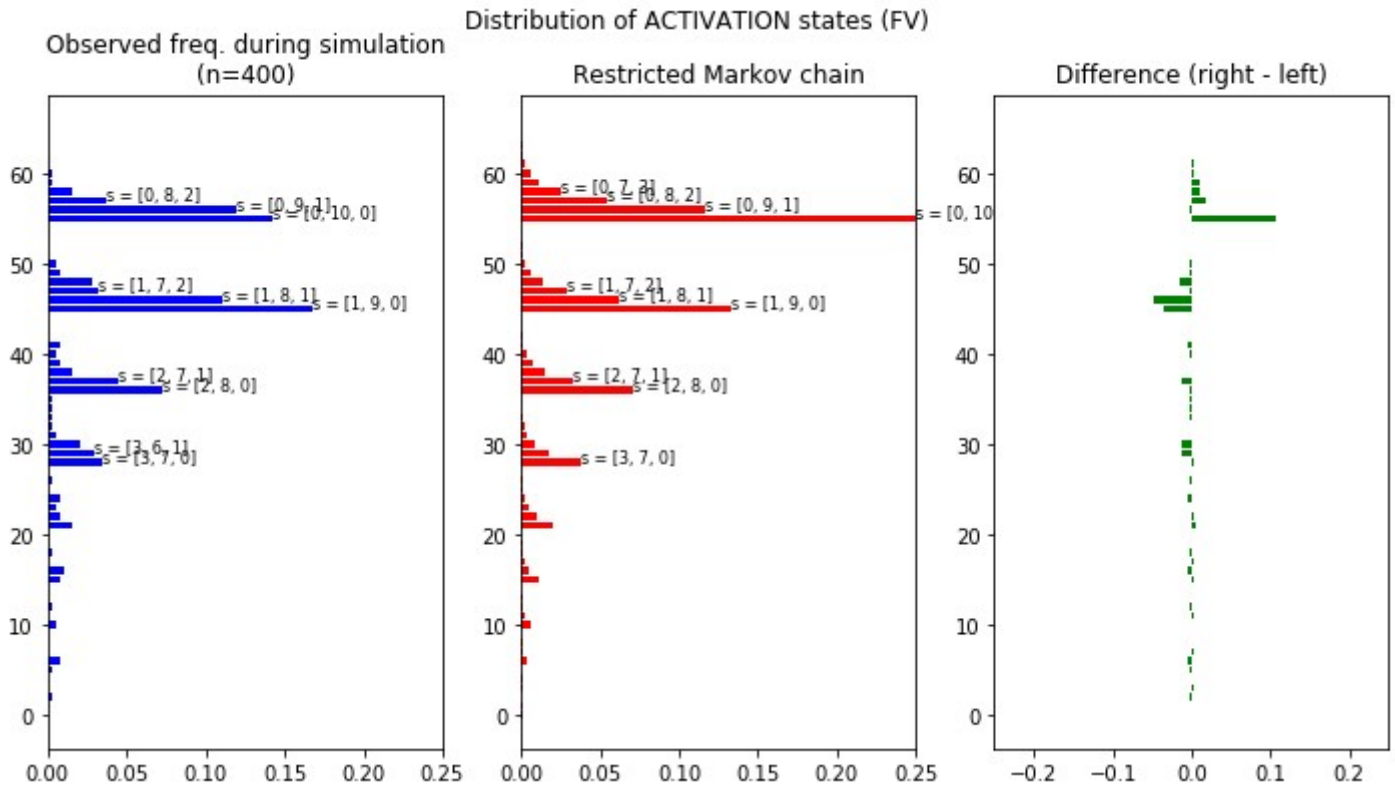

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 7, 3]
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
0
10
20
30
40
50
60
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2

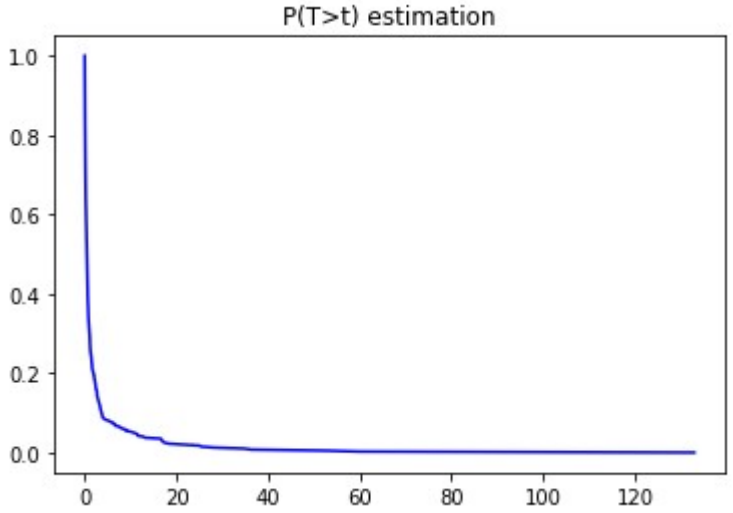


K=20, rhos=[0.4, 0.75, 0.35], N=400, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=24.5(n=400), finalize=ABS, seed=1727

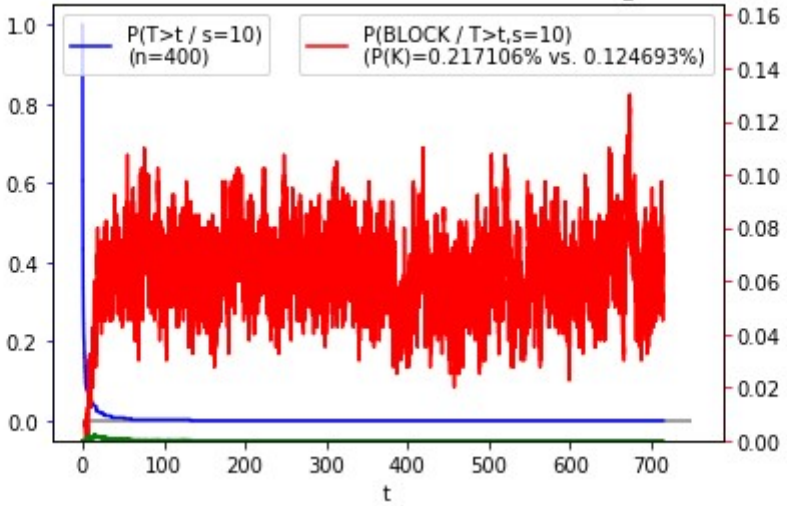


<matplotlib.figure.Figure at 0x2792f3dd208>

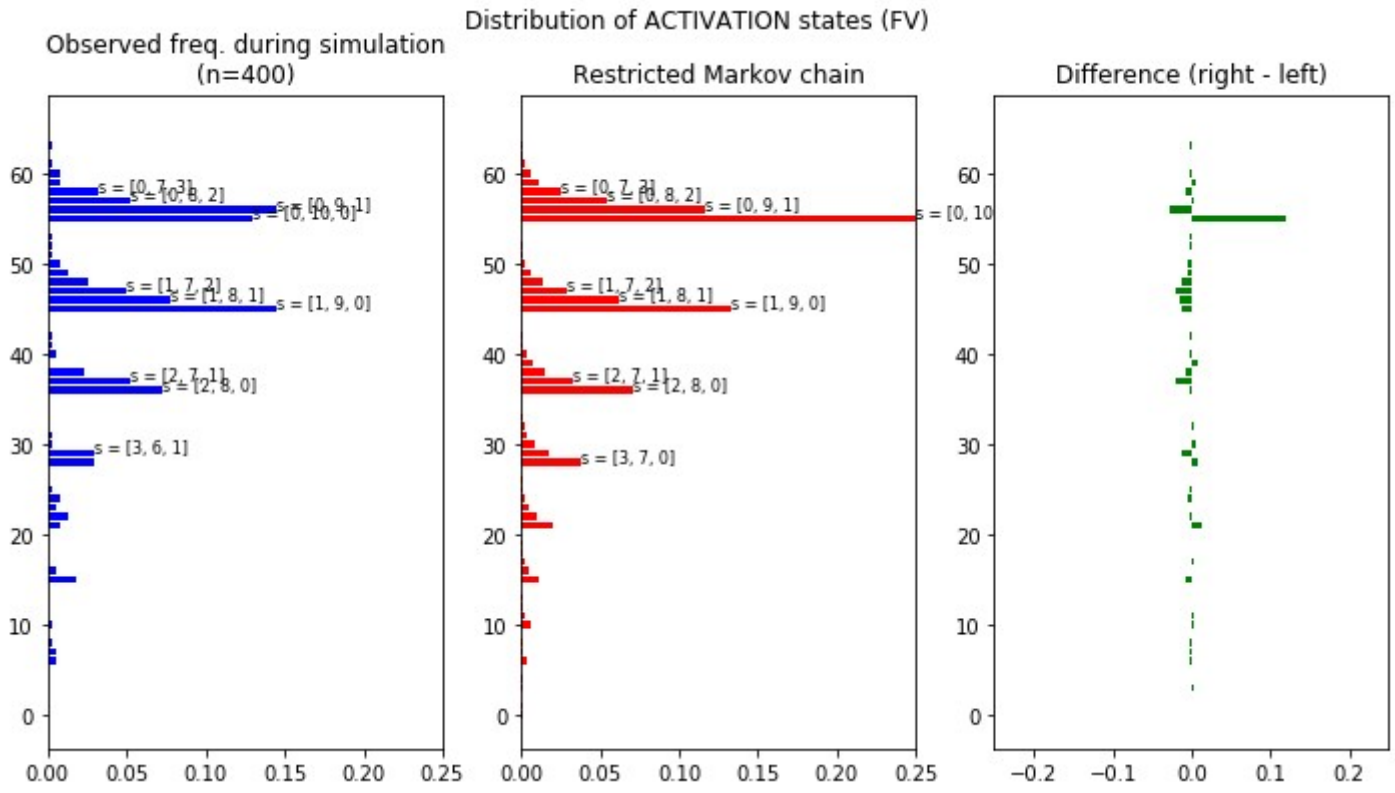

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
s = [0, 7, 3]
0
10
20
30
40
50
60
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2

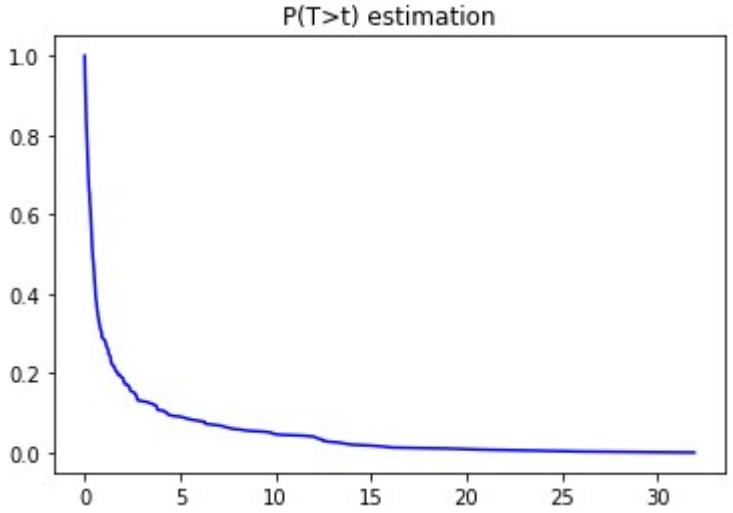


K=20, rhos=[0.4, 0.75, 0.35], N=400, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=26.0(n=400), finalize=ABS, seed=1737

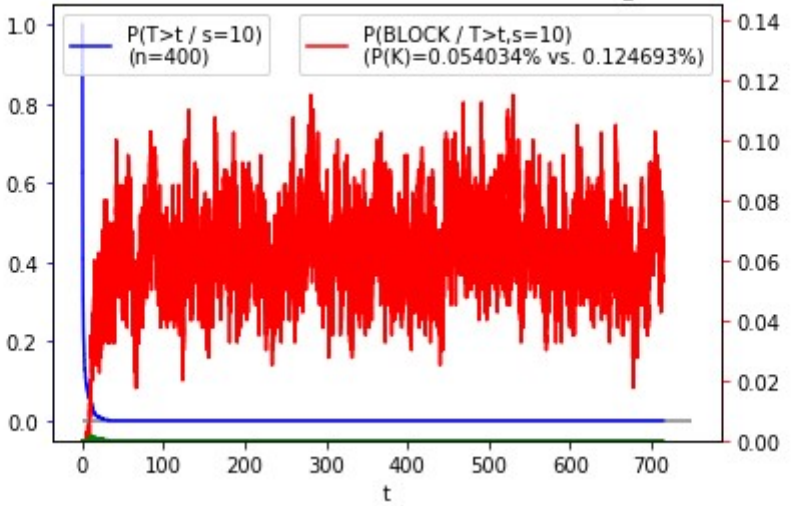


<matplotlib.figure.Figure at 0x2791f7532b0>

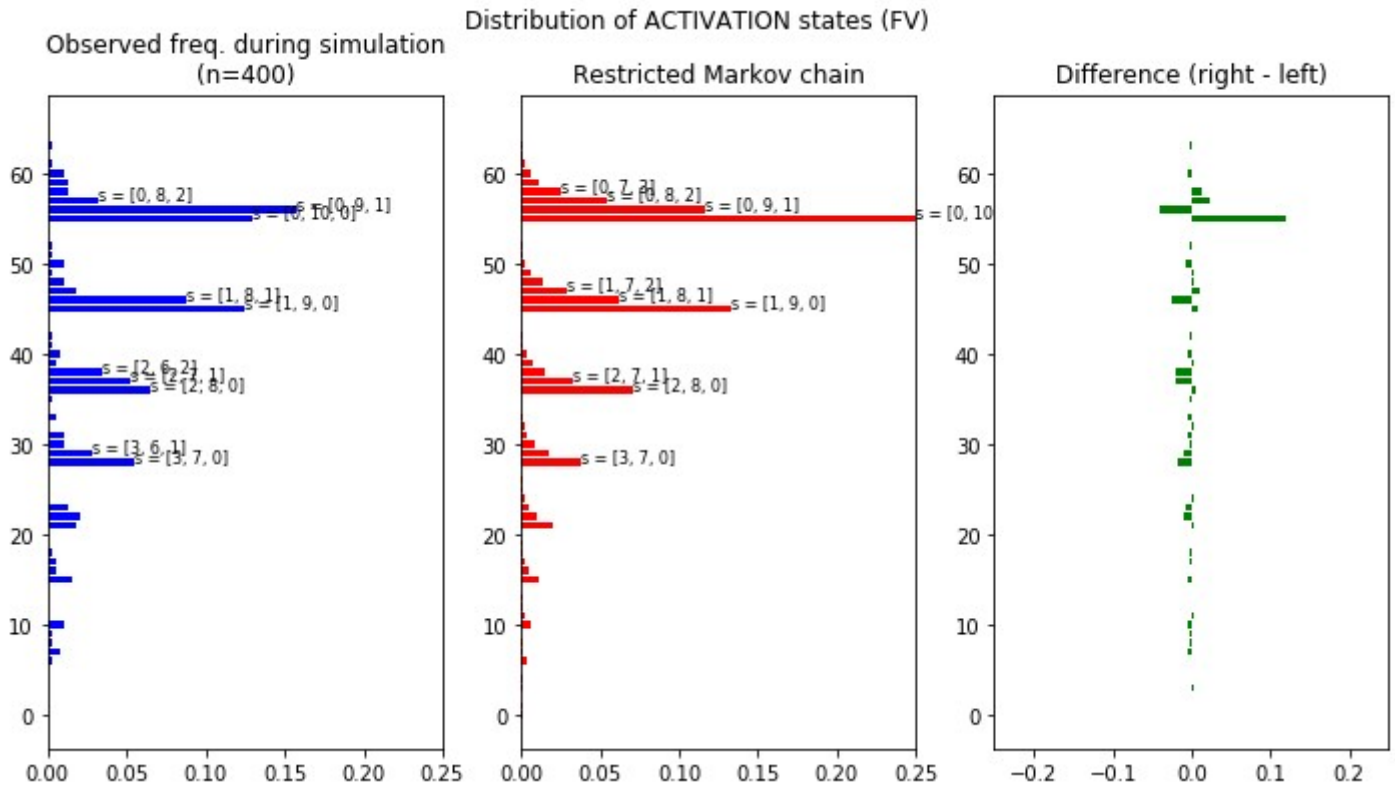

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 7, 3]
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2

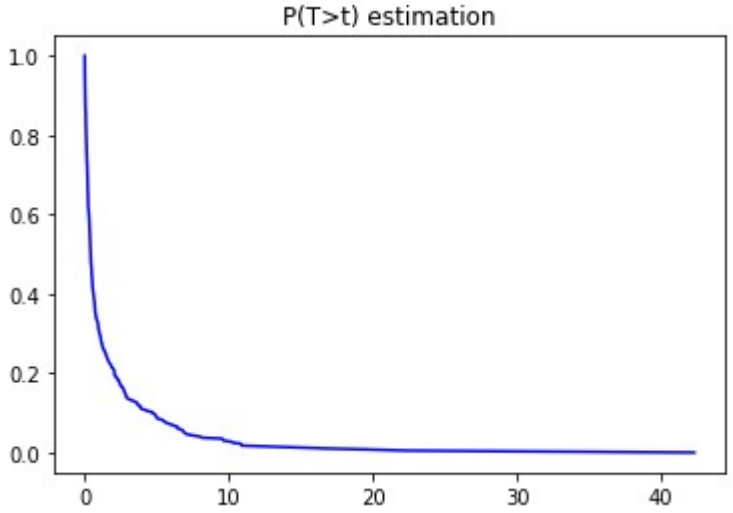


K=20, rhos=[0.4, 0.75, 0.35], N=400, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=20.6(n=400), finalize=ABS, seed=1747

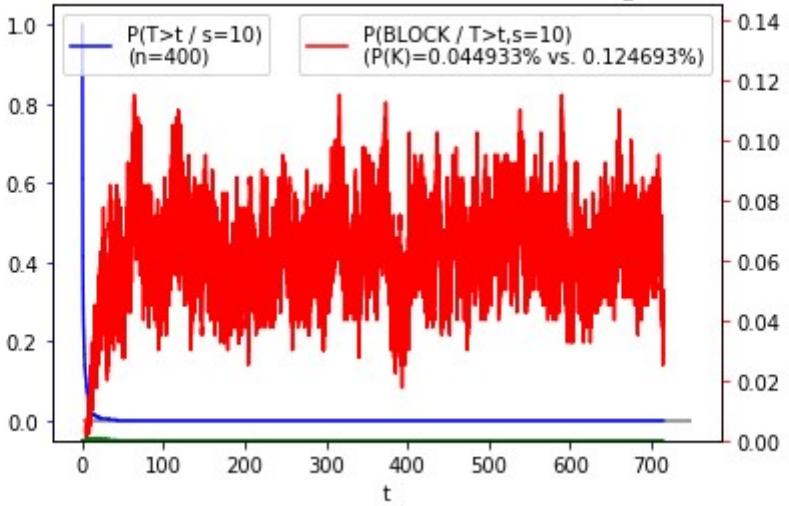


<matplotlib.figure.Figure at 0x2793135d7b8>

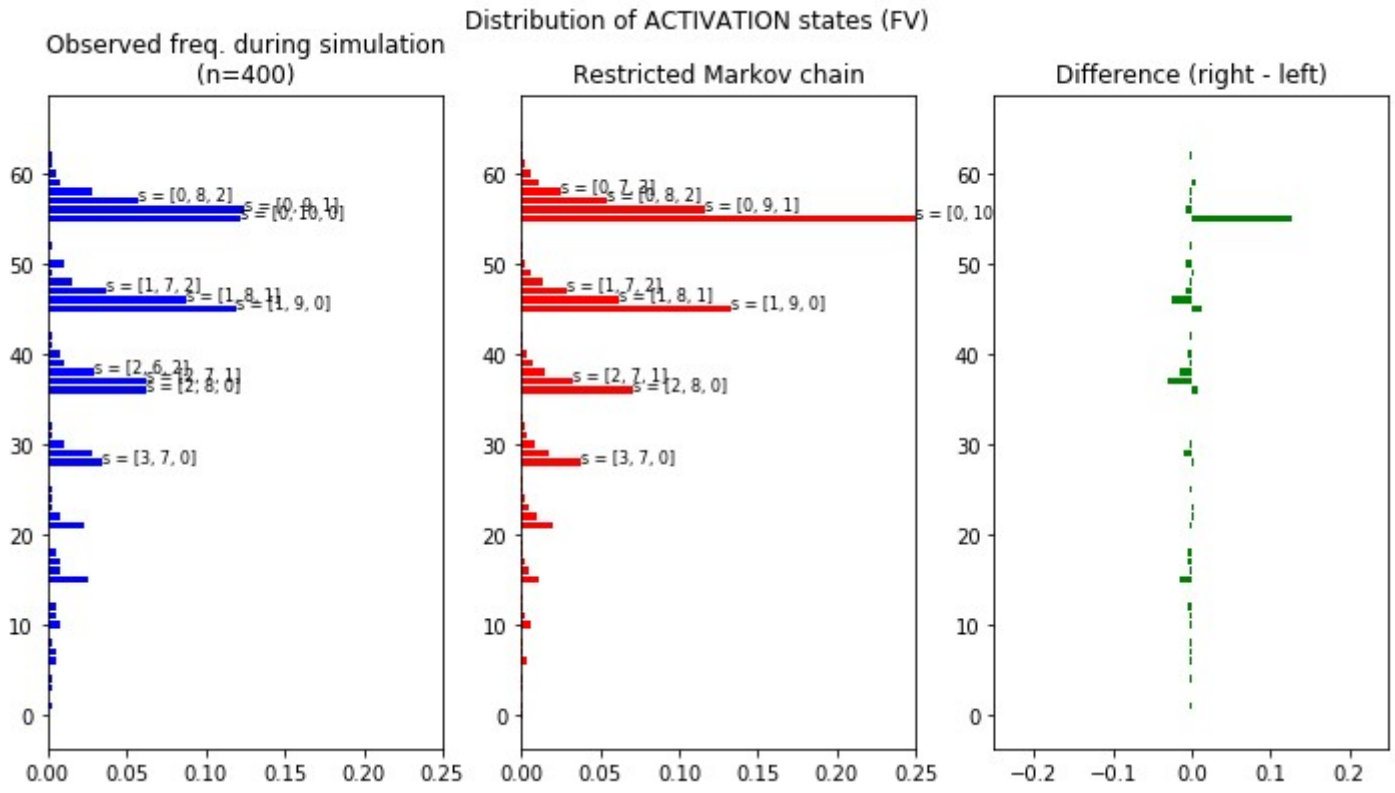

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 6, 2]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
s = [0, 7, 2]
s = [1, 7, 2]
0
10
20
30
40
50
60
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2

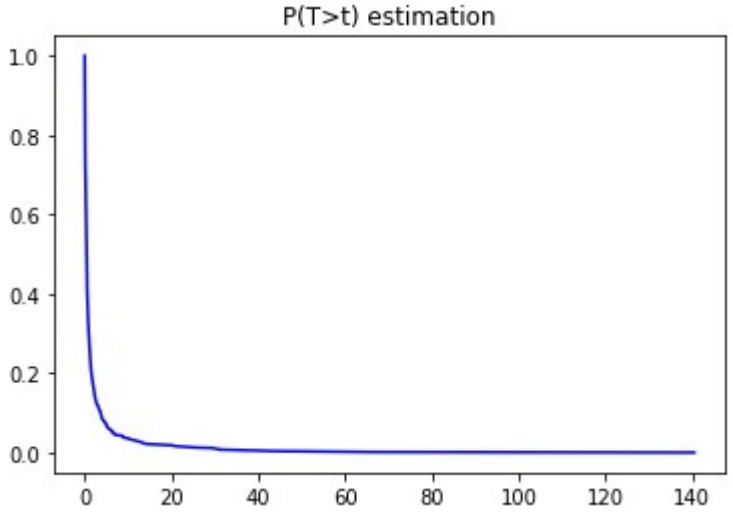


K=20, rhos=[0.4, 0.75, 0.35], N=400, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=22.6(n=400), finalize=ABS, seed=1757

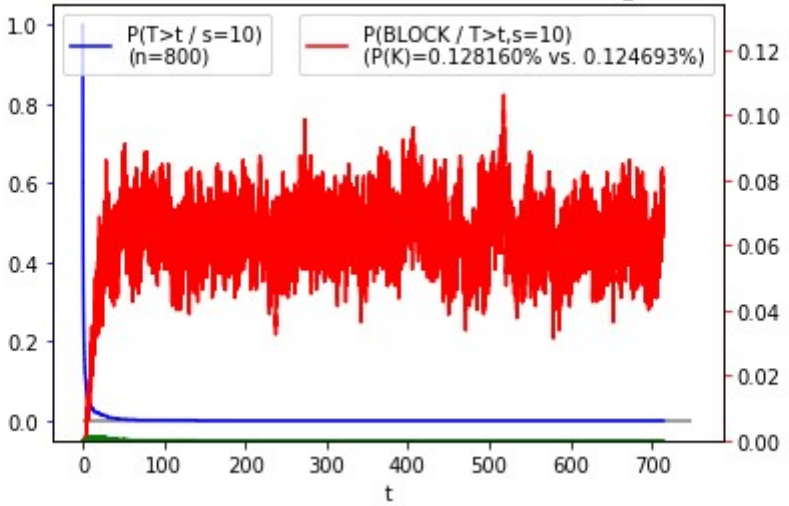


<matplotlib.figure.Figure at 0x27934ff7438>

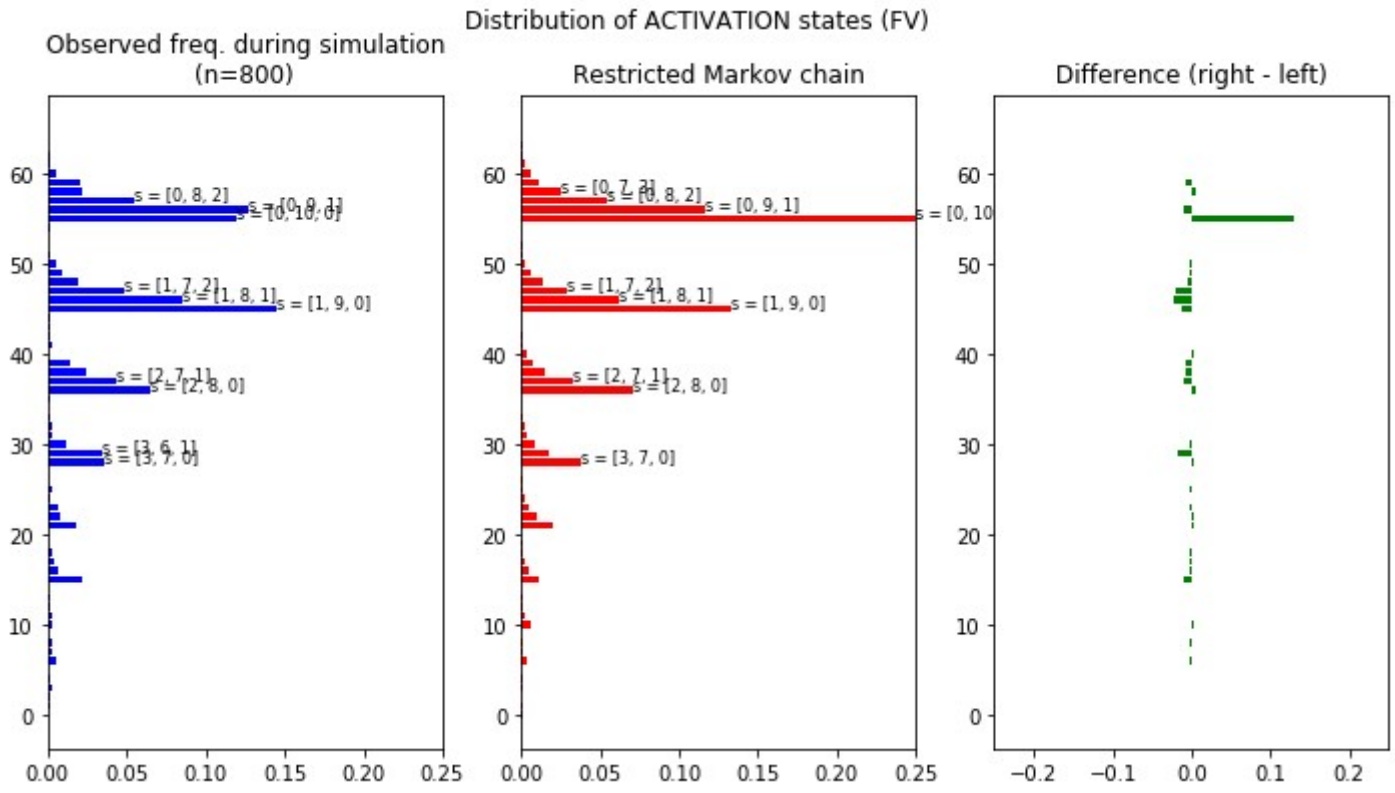

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=400)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 7, 0]
s = [0, 9, 1]
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2
0
10
20
30
40
50
60

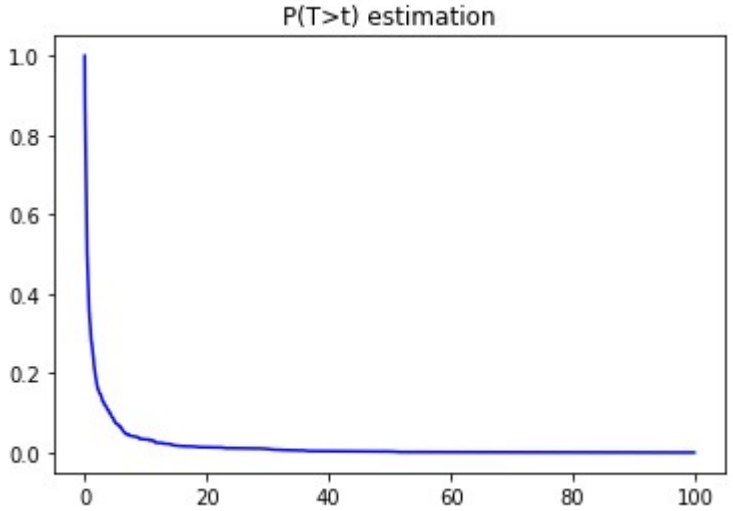


K=20, rhos=[0.4, 0.75, 0.35], N=800, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=27.0(n=800), finalize=ABS, seed=1717

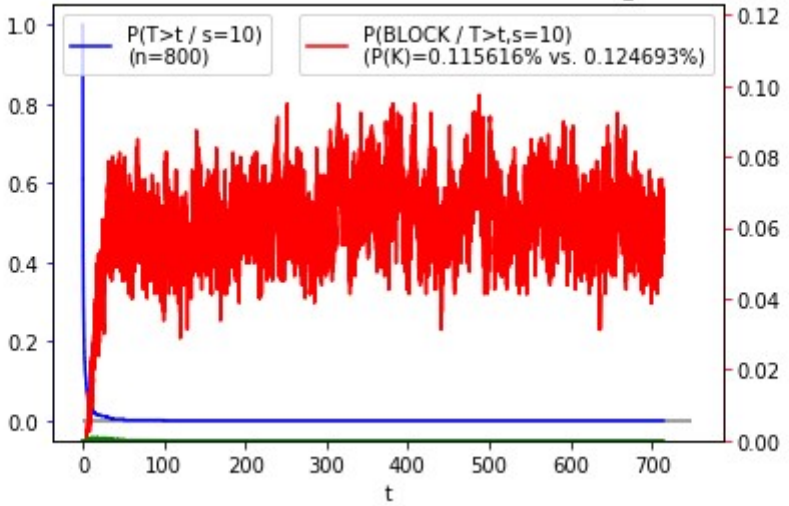


<matplotlib.figure.Figure at 0x27946d4e400>

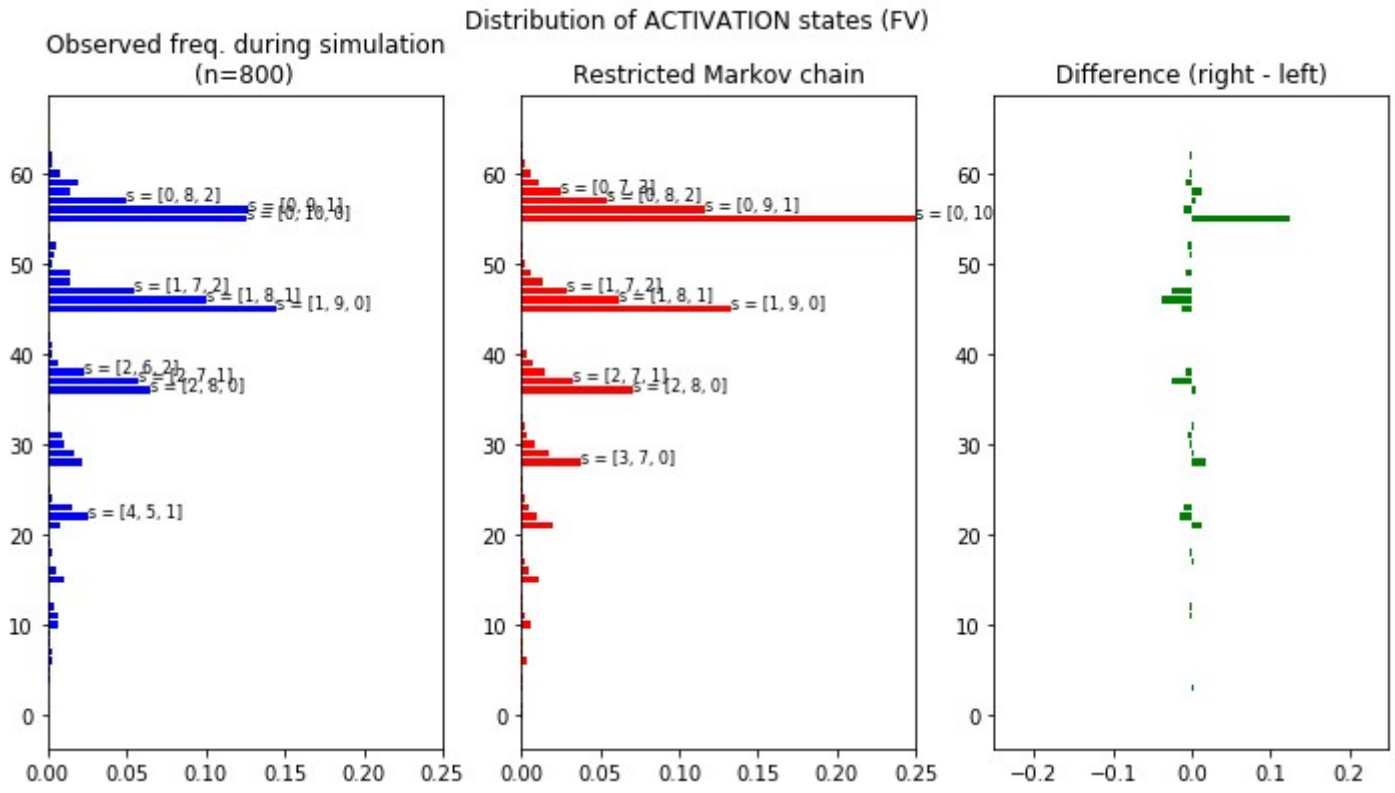

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2
0
10
20
30
40
50
60

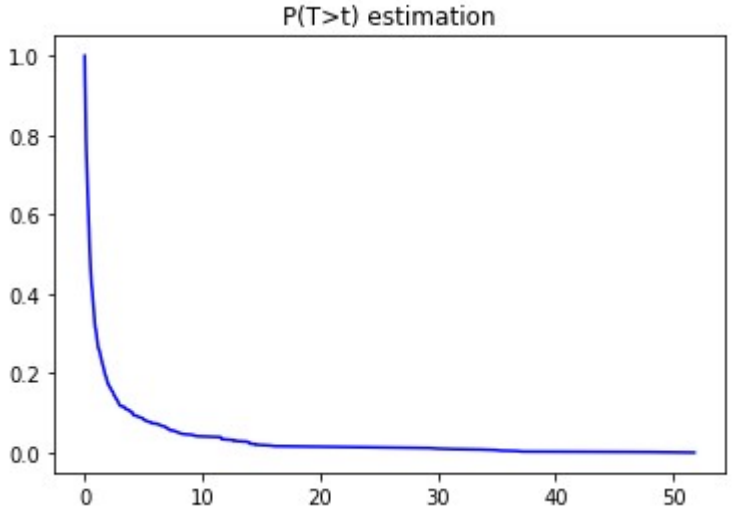


K=20, rhos=[0.4, 0.75, 0.35], N=800, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=19.3(n=800), finalize=ABS, seed=1727

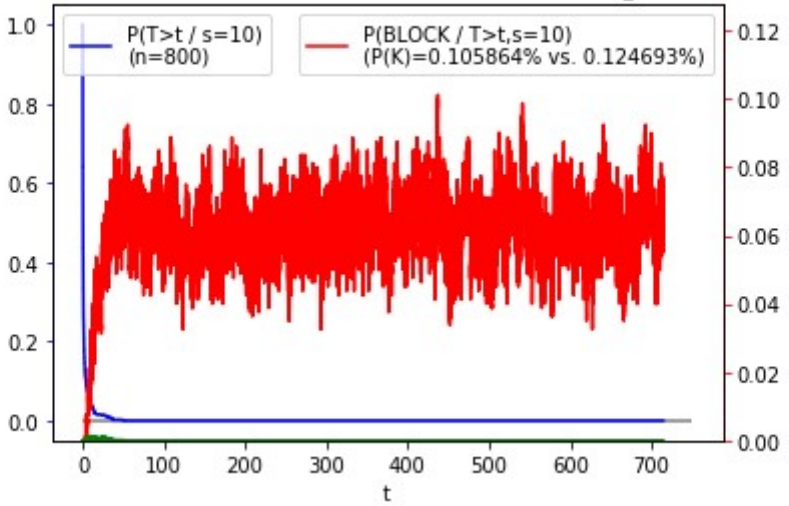


<matplotlib.figure.Figure at 0x279663cd748>

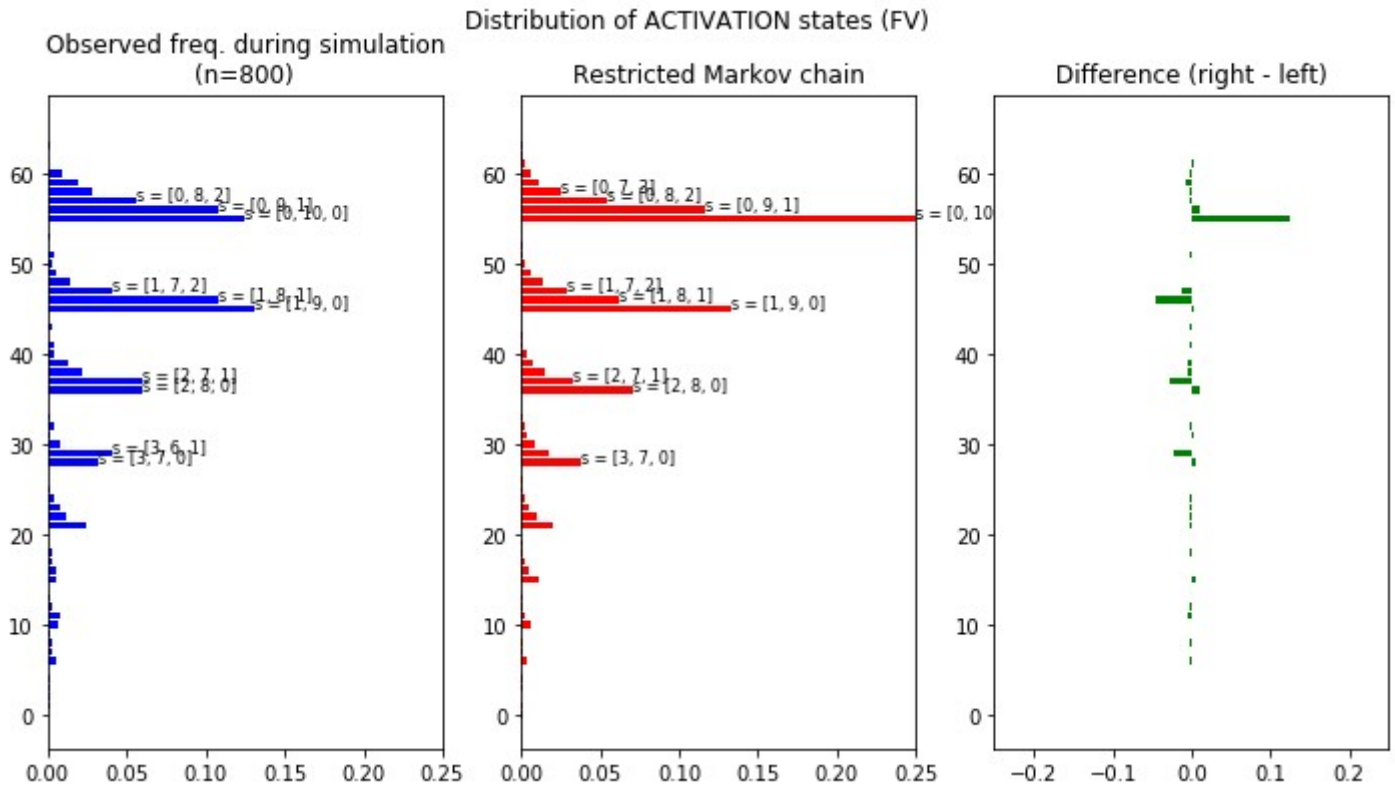

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [4, 5, 1]
s = [3, 7, 0]

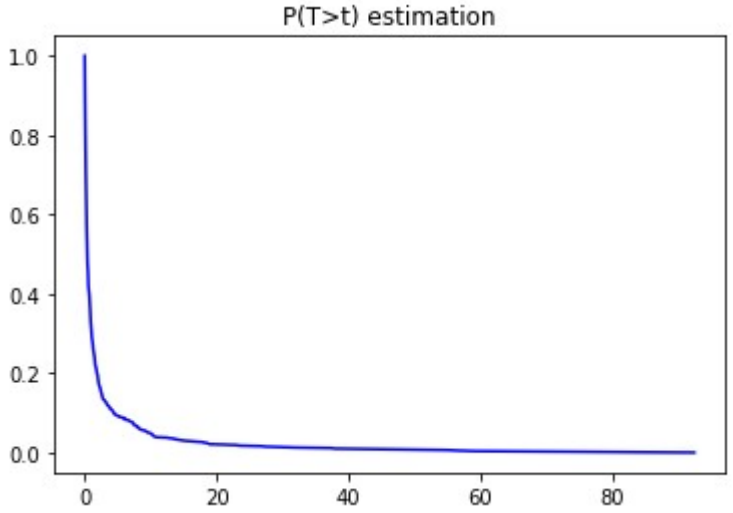


K=20, rhos=[0.4, 0.75, 0.35], N=800, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=22.3(n=800), finalize=ABS, seed=1737

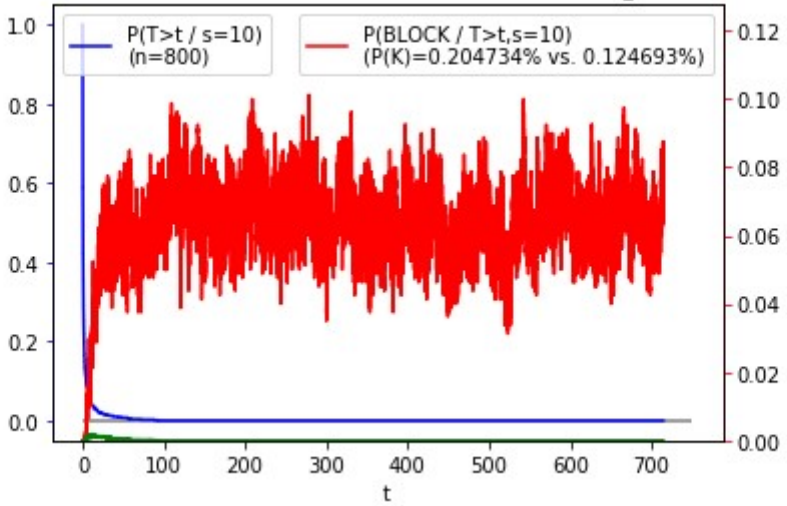


<matplotlib.figure.Figure at 0x279541d7128>

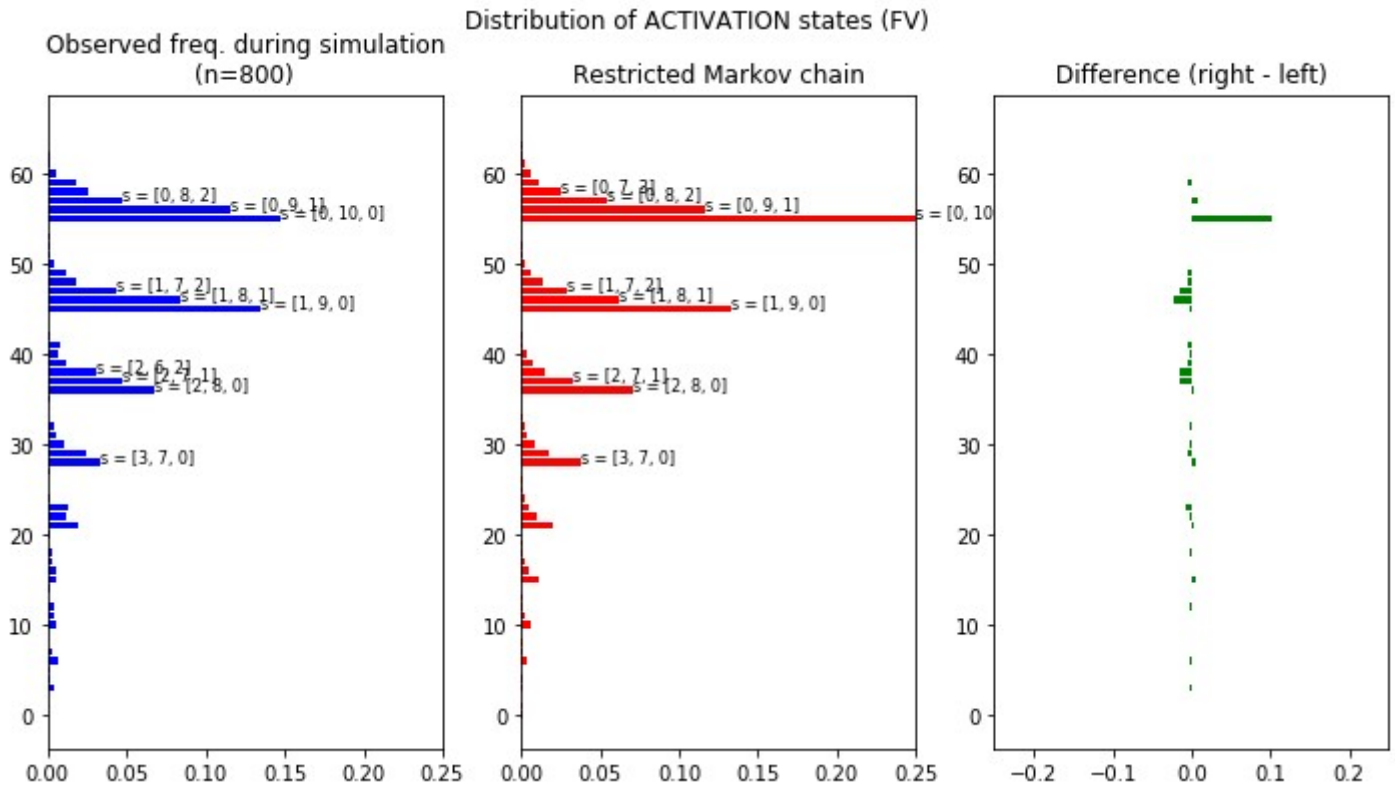

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
0
10
20
30
40
50
60
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2

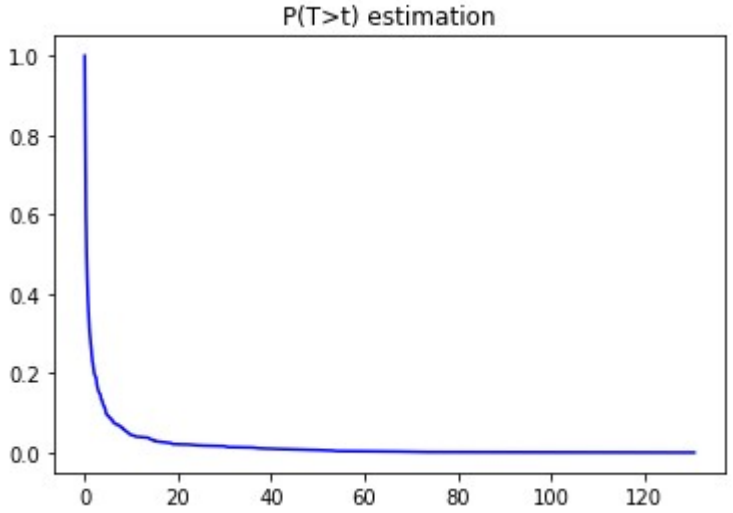


K=20, rhos=[0.4, 0.75, 0.35], N=800, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=23.6(n=800), finalize=ABS, seed=1747

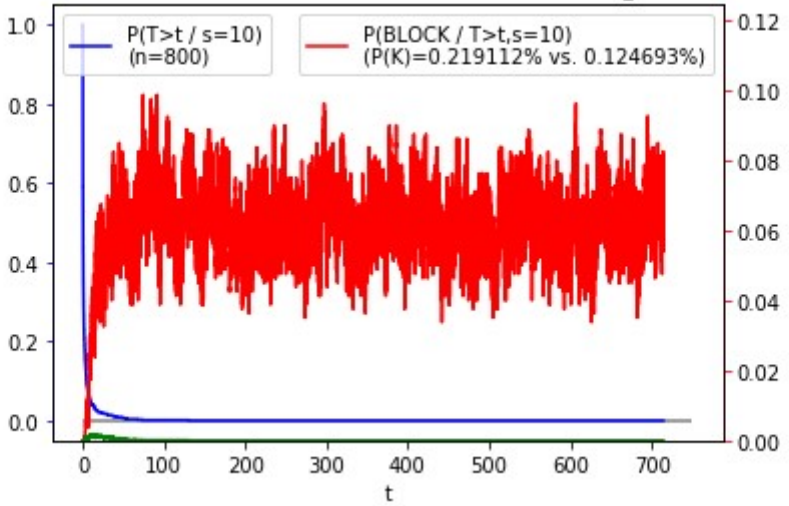


<matplotlib.figure.Figure at 0x2794479a2e8>

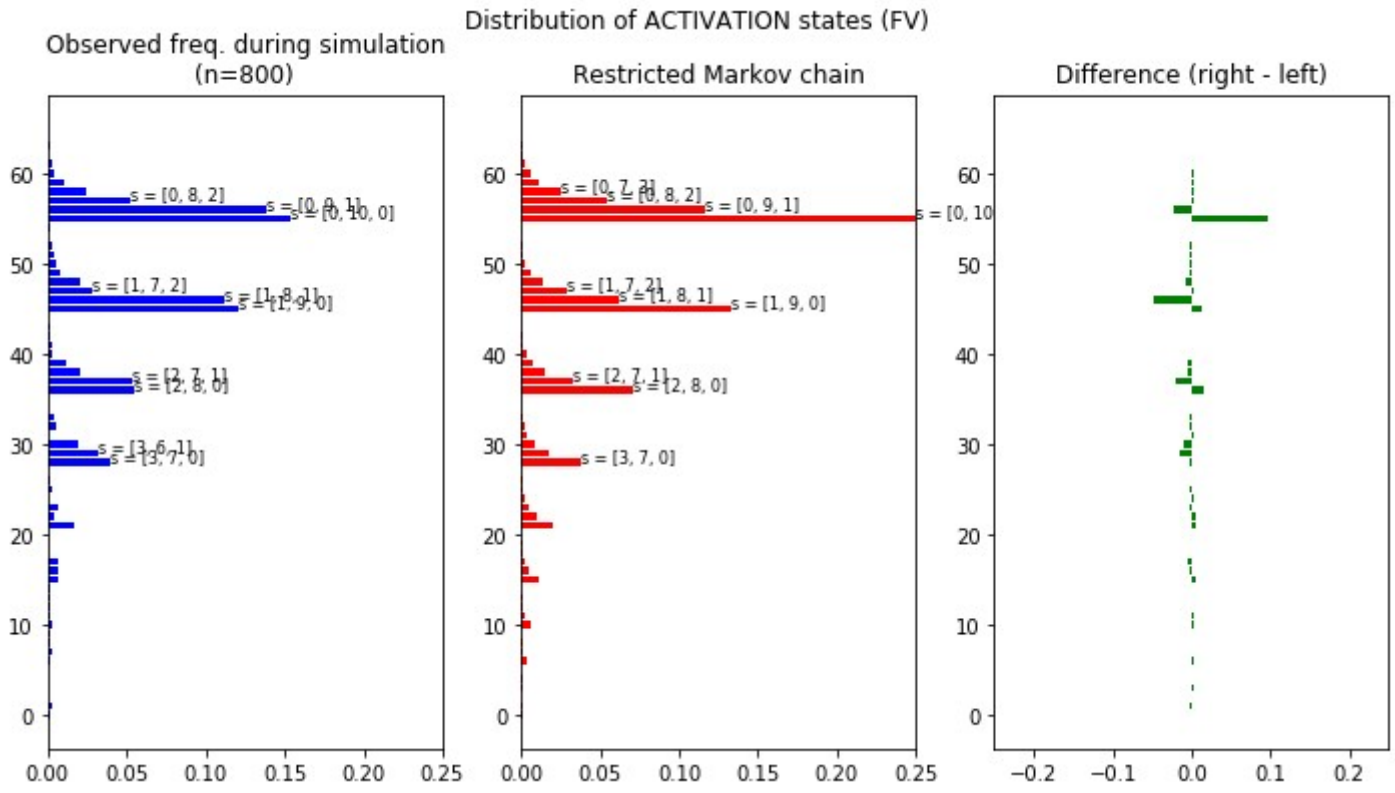

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 6, 2]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 7, 0]
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2
0
10
20
30
40
50
60

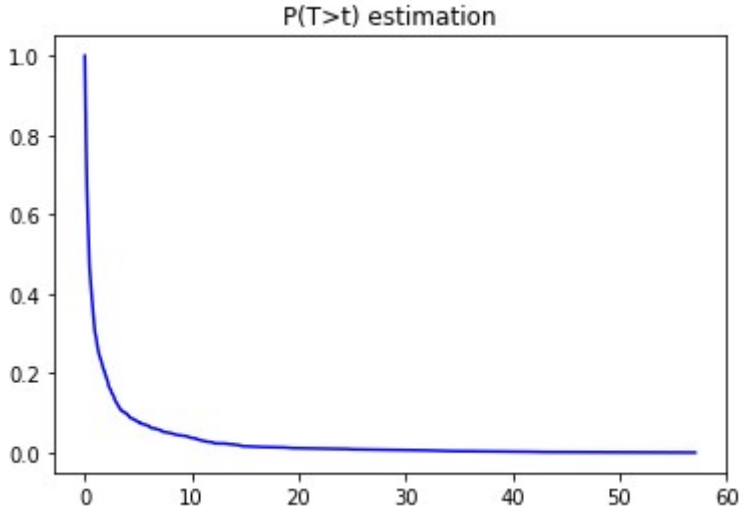


K=20, rhos=[0.4, 0.75, 0.35], N=800, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=23.6(n=800), finalize=ABS, seed=1757

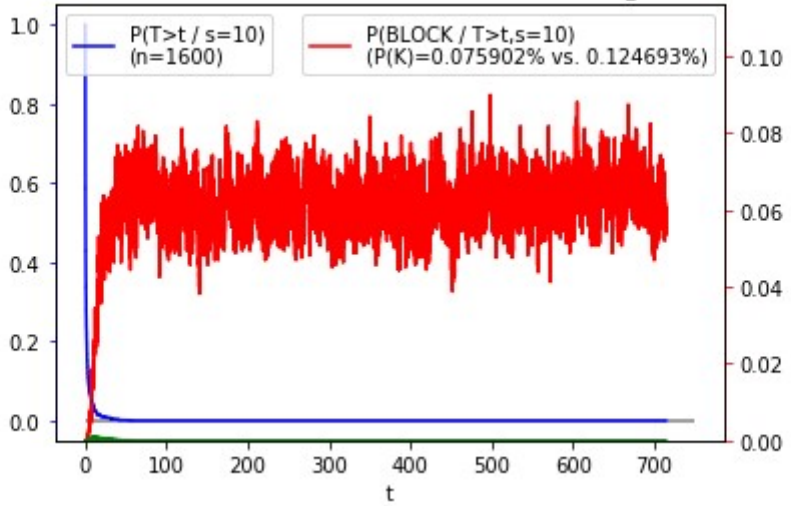


<matplotlib.figure.Figure at 0x279638e7550>

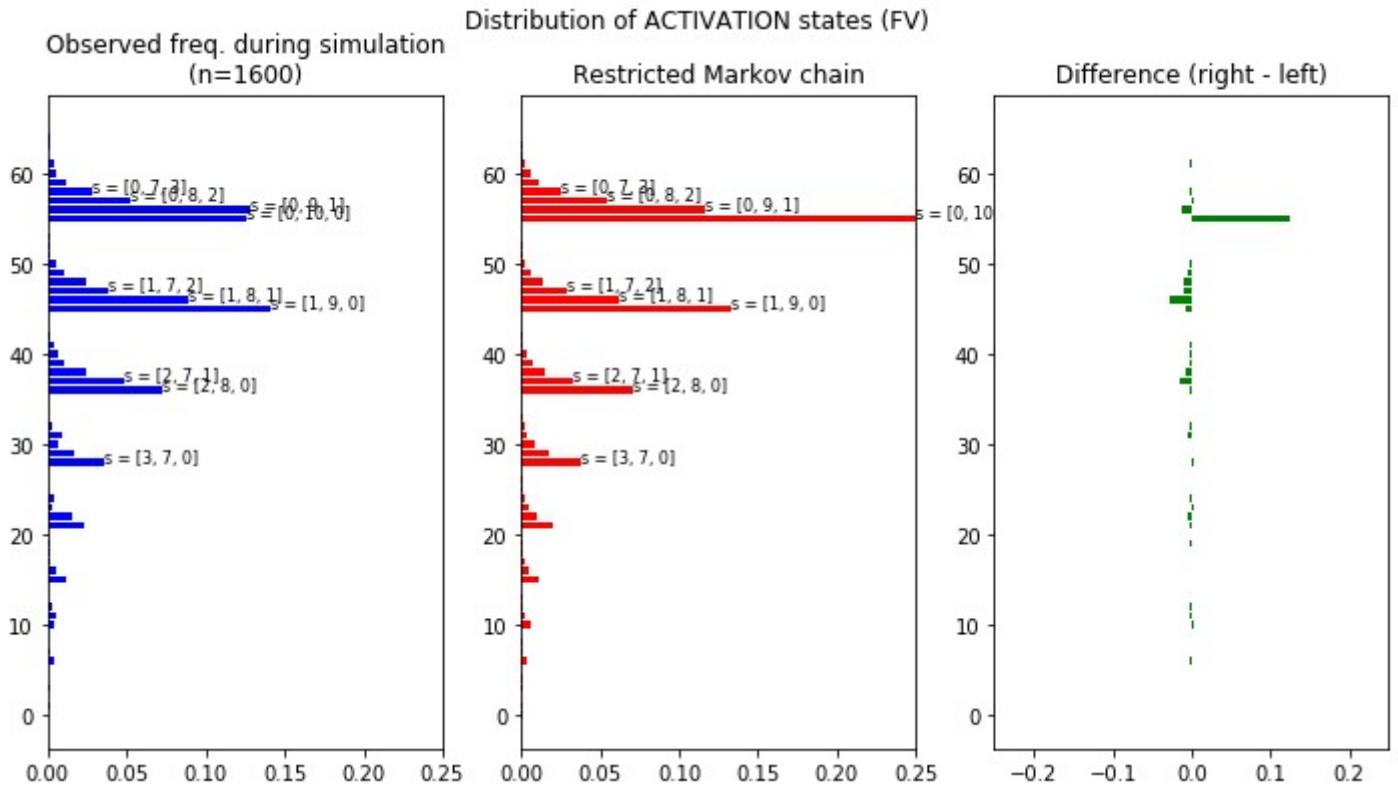

Distribution of ACTIVATION states (FV)
Observed freq. during simulation
(n=800)
Restricted Markov chain
Difference (right - left)
s = [0, 8, 2]
s = [0, 9, 1]
s = [0, 10, 0]
s = [1, 7, 2]
s = [1, 8, 1]
s = [1, 9, 0]
s = [2, 7, 1]
s = [2, 8, 0]
s = [3, 6, 1]
s = [3, 7, 0]
s = [0, 7, 3]
s = [0, 10
0
10
20
30
40
50
60
0.00
0.05
0.10
0.15
0.20
0.25
−0.2
−0.1
0.0
0.1
0.2



K=20, rhos=[0.4, 0.75, 0.35], N=1600, activation size=10, maxtime(1)=0.0, maxtime(N)=714.3, mean_lifetime=23.5(n=1600), finalize=ABS, seed=1717



<matplotlib.figure.Figure at 0x279513850b8>




```
In [2]:

In [2]: df_results = pd.read_csv("../../RL-002-QueueBlocking/results/test_fv_implementation_20210615_000100_results (nservers=3, K=20, activation=0.5K).csv")

In [3]: df_results_agg_by_N = aggregation_bygroups(df_results, ['N'], ['#Events(MC)', '#Cycles(MC)', 'Pr(MC)', '#Events(FV)', 'Pr(FV)'])
   ...: print("Aggregated results by N:")
   ...: print(df_results_agg_by_N)
Aggregated results by N:
    #Events(MC)                                                          \
          count       mean          std        min        max           SE
N
400           5   978038.4  3955.588932   972036.0   983157.0  1768.993149
800           5  1959015.6  5910.510706  1951968.0  1966368.0  2643.260744

    #Cycles(MC)                                  ...     #Events(FV)  \
          count     mean         std      min    ...             std
```

```
N                                                ...
400           5  25098.2  361.869728  24590.0    ...     3955.588932
800           5  50265.8  679.149615  49470.0    ...     5910.510706

                                     Pr(FV)                                \
          min        max           SE  count      mean       std       min
N
400   972036.0   983157.0  1768.993149      5  0.001058  0.000728  0.000449
800  1951968.0  1966368.0  2643.260744      5  0.001547  0.000531  0.001059


          max        SE
N
400  0.002171  0.000325
800  0.002191  0.000237

[2 rows x 30 columns]

In [4]: df_results = pd.merge(df_results, df_results_agg_by_N.xs('mean', axis=1, level=1)[['#Events(MC)', '#Cycles(MC)', '#Events(FV)']],
   ...:                       left_on='N', right_index=True, suffixes=["", "_mean"])
   ...: # Convert average to integer
   ...: df_results = df_results.astype({'#Events(MC)_mean': np.int})
   ...: df_results = df_results.astype({'#Cycles(MC)_mean': np.int})
   ...: df_results = df_results.astype({'#Events(FV)_mean': np.int})

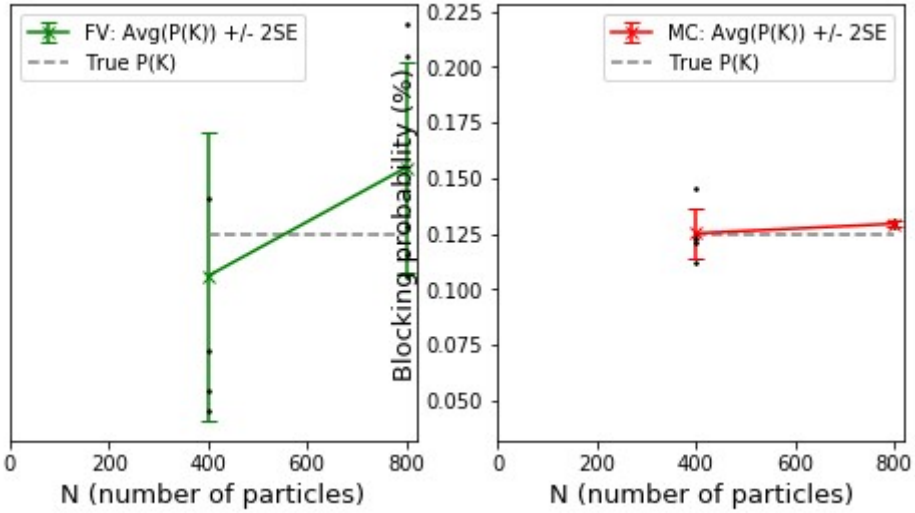
In [5]: markersize=3, fontsize=13, showtitle=False, figfile=None
  File "<ipython-input-5-72cdf4a415a9>", line 1
    markersize=3, fontsize=13, showtitle=False, figfile=None
               ^
SyntaxError: can't assign to literal


In [6]:

In [6]: markersize=3; fontsize=13; showtitle=False; figfile=None

In [7]: (ax_fv, ax_mc) = plt.figure(figsize=(8,4)).subplots(1,2)
   ...:
   ...: # MC
   ...: ax_mc.plot(df_results['N'], df_results['Pr(MC)']*100, 'k.', markersize=markersize)
   ...: line_mc = ax_mc.errorbar(list(df_results_agg_by_N.index), df_results_agg_by_N['Pr(MC)']['mean']*100, yerr=2*df_results_agg_by_N['Pr(MC)']['SE']*100,
capsize=4, color='red', marker='x')
   ...: line_ref_mc = ax_mc.hlines(df_results.iloc[0]['Pr(K)']*100, df_results.iloc[0]['N'], df_results.iloc[-1]['N'], color='gray', linestyles='dashed')
   ...: legend_mc = [line_mc, line_ref_mc]
   ...:
   ...: # FV
   ...: ax_fv.plot(df_results['N'], df_results['Pr(FV)']*100, 'k.', markersize=markersize)
   ...: line_fv = ax_fv.errorbar(list(df_results_agg_by_N.index), df_results_agg_by_N['Pr(FV)']['mean']*100, yerr=2*df_results_agg_by_N['Pr(FV)']['SE']*100,
```

```
capsize=4, color='green', marker='x')
   ...: line_ref_fv = ax_fv.hlines(df_results.iloc[0]['Pr(K)']*100, df_results.iloc[0]['N'], df_results.iloc[-1]['N'], color='gray', linestyles='dashed')
   ...: legend_fv = [line_fv, line_ref_fv]
   ...: if showtitle:
   ...:     plt.title(title, fontsize=10)
   ...:
   ...:
   ...: # Axis limits
   ...: ymin = min(ax_mc.get_ylim()[0], ax_fv.get_ylim()[0])
   ...: ymax = max(ax_mc.get_ylim()[1], ax_fv.get_ylim()[1])
   ...: ax_mc.set_xlim([0, ax_mc.get_xlim()[1]])
   ...: ax_mc.set_ylim([ymin, ymax])
   ...: ax_mc.set_xlabel("N (number of particles)", fontsize=fontsize)
   ...: ax_mc.set_ylabel("Blocking probability (%)", fontsize=fontsize)
   ...: ax_mc.legend(legend_mc, ['MC: Avg(P(K)) +/- 2SE', 'True P(K)'])#, fontsize='x-small')
   ...: ax_fv.yaxis.set_ticks([]); ax_fv.yaxis.set_ticklabels([])  # Remove ticks and labels from the right plot as the axis is the same as on the left plot
   ...: ax_fv.set_xlim([0, ax_fv.get_xlim()[1]])
   ...: ax_fv.set_ylim([ymin, ymax])
   ...: ax_fv.set_xlabel("N (number of particles)", fontsize=fontsize)
   ...: ax_fv.legend(legend_fv, ['FV: Avg(P(K)) +/- 2SE', 'True P(K)'])#, fontsize='x-small')
Out[7]: <matplotlib.legend.Legend at 0x279d747c470>
```



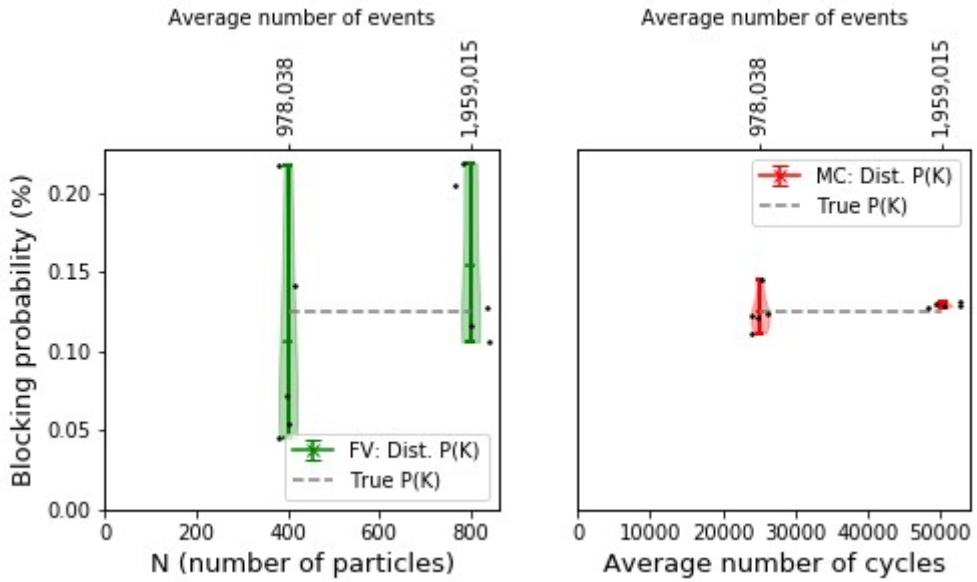

```
In [8]: figfile = "../../RL-002-QueueBlocking/results/test_fv_implementation_20210615_000100_results.png")
  File "<ipython-input-8-0c90fdcd87b8>", line 1
    figfile = "../../RL-002-QueueBlocking/results/test_fv_implementation_20210615_000100_results.png")
                                                                                                      ^
SyntaxError: invalid syntax
```

```
In [9]:

In [9]: figfile = "../../RL-002-QueueBlocking/results/test_fv_implementation_20210615_000100_results.png"

In [10]: (ax_fv, ax_mc) = plt.figure(figsize=(8,4)).subplots(1,2)
    ...: #x_mc = '#Events(MC)_mean'
    ...: x_mc = '#Cycles(MC)_mean'
    ...: x_mc_label = "Average number of cycles"
    ...: x_mc2 = '#Events(MC)_mean'
    ...: x_mc2_label = "Average number of events"
    ...: x_fv2 = '#Events(FV)_mean'
    ...: x_fv2_label = x_mc2_label
    ...: ax_left = ax_fv
    ...: ax_right = ax_mc
    ...: N_values = np.unique(df_results['N'])
    ...: x_mc_values = np.unique(df_results[x_mc])
    ...: x_mc2_values = np.unique(df_results[x_mc2])
    ...: x_fv2_values = np.unique(df_results[x_fv2])
    ...: violin_widths_mc = (x_mc_values[-1] - x_mc_values[0]) / 10
    ...: violin_widths_fv = (N_values[-1] - N_values[0]) / 10
    ...: plotting.violinplot(ax_mc,  [df_results[ df_results[x_mc]==x ]['Pr(MC)']*100 for x in x_mc_values],
    ...:                             positions=x_mc_values, showmeans=True, showmedians=False, linewidth=2, widths=violin_widths_mc,
    ...:                             color_body="red", color_lines="red", color_means="red")
    ...: plotting.violinplot(ax_fv,  [df_results[ df_results['N']==x ]['Pr(FV)']*100 for x in N_values],
    ...:                             positions=N_values, showmeans=True, showmedians=False, linewidth=2, widths=violin_widths_fv,
    ...:                             color_body="green", color_lines="green", color_means="green")
    ...: # Add the observed points
    ...: npoints = df_results.shape[0]
    ...: jitter = 1 + 0.1*(np.random.random(npoints) - 0.5)
    ...: ax_mc.plot(df_results[x_mc]*jitter, df_results['Pr(MC)']*100, 'k.', markersize=markersize)
    ...: ax_fv.plot(df_results['N']*jitter, df_results['Pr(FV)']*100, 'k.', markersize=markersize)
    ...:
    ...: line_ref_mc = ax_mc.hlines(df_results.iloc[0]['Pr(K)']*100, df_results.iloc[0][x_mc], df_results.iloc[-1][x_mc], color='gray', linestyles='dashed')
    ...: line_ref_fv = ax_fv.hlines(df_results.iloc[0]['Pr(K)']*100, df_results.iloc[0]['N'], df_results.iloc[-1]['N'], color='gray', linestyles='dashed')
    ...: #Legend_mc = [line_mc, line_ref_mc]
    ...: #Legend_fv = [line_fv, line_ref_fv]
    ...: if showtitle:
    ...:     plt.suptitle(title, fontsize=int(fontsize*1.1))
    ...:
    ...:
    ...: # Set a common vertical axis
    ...: #ymin = min(ax_mc.get_ylim()[0], ax_fv.get_ylim()[0])
    ...: ymin = 0
    ...: ymax = max(ax_mc.get_ylim()[1], ax_fv.get_ylim()[1])
    ...: ax_mc.set_xlim([0, ax_mc.get_xlim()[1]])
    ...: ax_mc.set_ylim([ymin, ymax])
```

```
    ...: ax_mc.set_xlabel(x_mc_label, fontsize=fontsize)
    ...: ax_mc.legend(legend_mc, ['MC: Dist. P(K)', 'True P(K)'])#, fontsize='x-small')
    ...: ax_left.ticklabel_format(style='plain') # Ref: SO: prevent-scientific-notation-in-matplotlib-pyplot
    ...: #ax_left.set_yticklabels(["{:g}".format(y.get_position()[1]) for y in ax_left.get_yticklabels()])  # Avoid the 1e-5 at the corner of the axis (which
overlap with the duplicated X-axis placed on top)
    ...: ax_left.set_ylabel("Blocking probability (%)", fontsize=fontsize)
    ...: ax_right.yaxis.set_ticks([]); ax_right.yaxis.set_ticklabels([])  # Remove ticks and labels from the right plot as the axis is the same as on the left
plot
    ...: ax_fv.set_xlim([0, ax_fv.get_xlim()[1]])
    ...: ax_fv.set_ylim([ymin, ymax])
    ...: ax_fv.set_xlabel("N (number of particles)", fontsize=fontsize)
    ...: ax_fv.legend(legend_fv, ['FV: Dist. P(K)', 'True P(K)'])#, fontsize='x-small')
    ...:
    ...: # Add secondary x-axis to show the number of events in both FV and MC
    ...: ax_mc2 = ax_mc.twiny()
    ...: ax_mc2.set_xlim(ax_mc.get_xlim())
    ...: ax_mc2.set_xticks(x_mc_values)
    ...: ax_mc2.set_xticklabels(["{:,.0f}".format(x) for x in x_mc2_values], rotation=90)
    ...: ax_mc2.set_xlabel(x_mc2_label)
    ...: ax_fv2 = ax_fv.twiny()
    ...: ax_fv2.set_xlim(ax_fv.get_xlim())
    ...: ax_fv2.set_xticks(N_values)
    ...: ax_fv2.set_xticklabels(["{:,.0f}".format(x) for x in x_fv2_values], rotation=90)
    ...: ax_fv2.set_xlabel(x_fv2_label)
    ...:
    ...: if figfile is not None:
    ...:     plt.gcf().subplots_adjust(left=0.15, top=0.75)
    ...:     plt.savefig(figfile)
```


Average number of events
978,038
1,959,015
Blocking probability (%)
0.20
0.15
0.10
0.05
0.00
FV: Dist. P(K)
True P(K)
0
200
400
600
800
N (number of particles)
Average number of events
978,038
1,959,015
MC: Dist. P(K)
True P(K)
0
10000
20000
30000
40000
50000
Average number of cycles

In [11]: