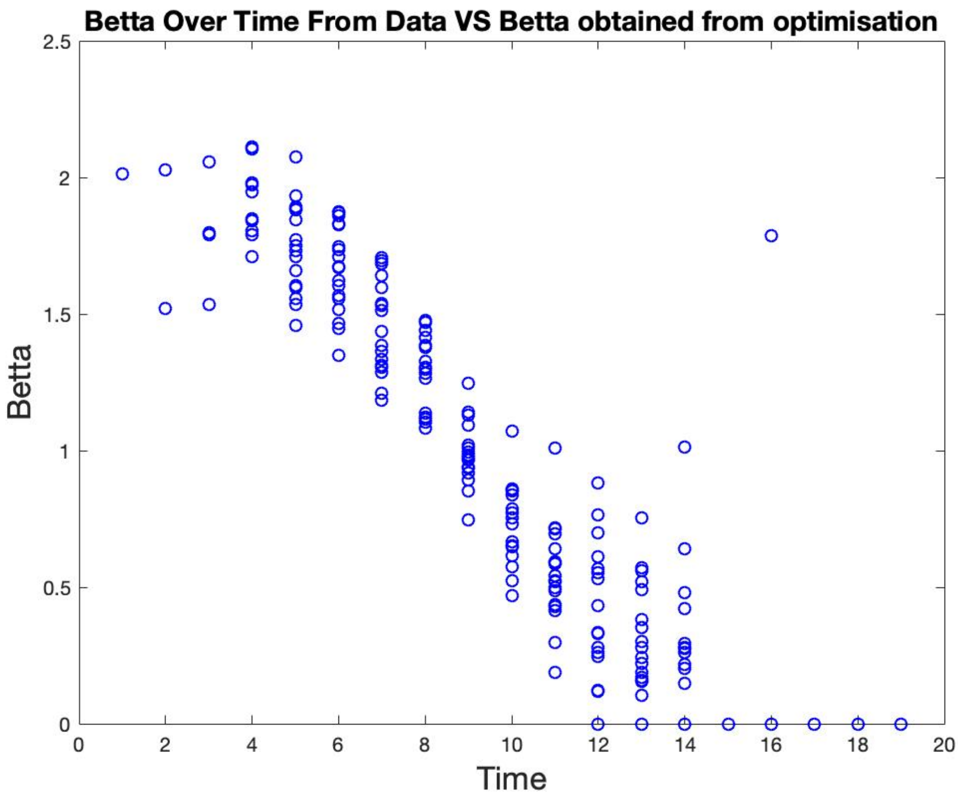
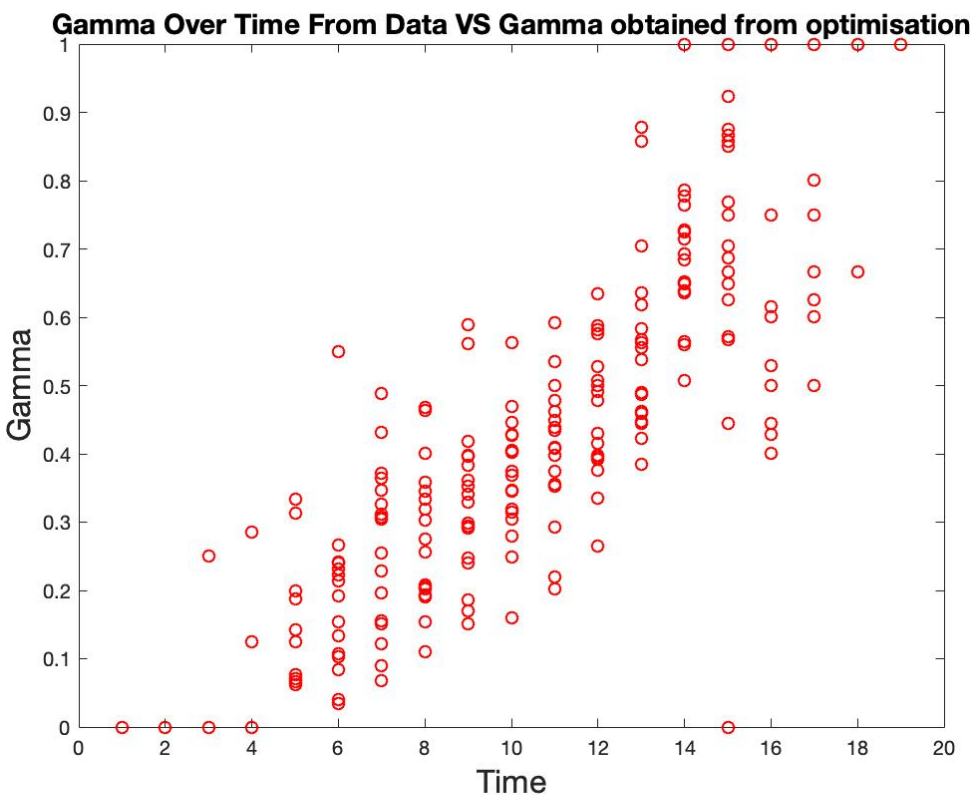
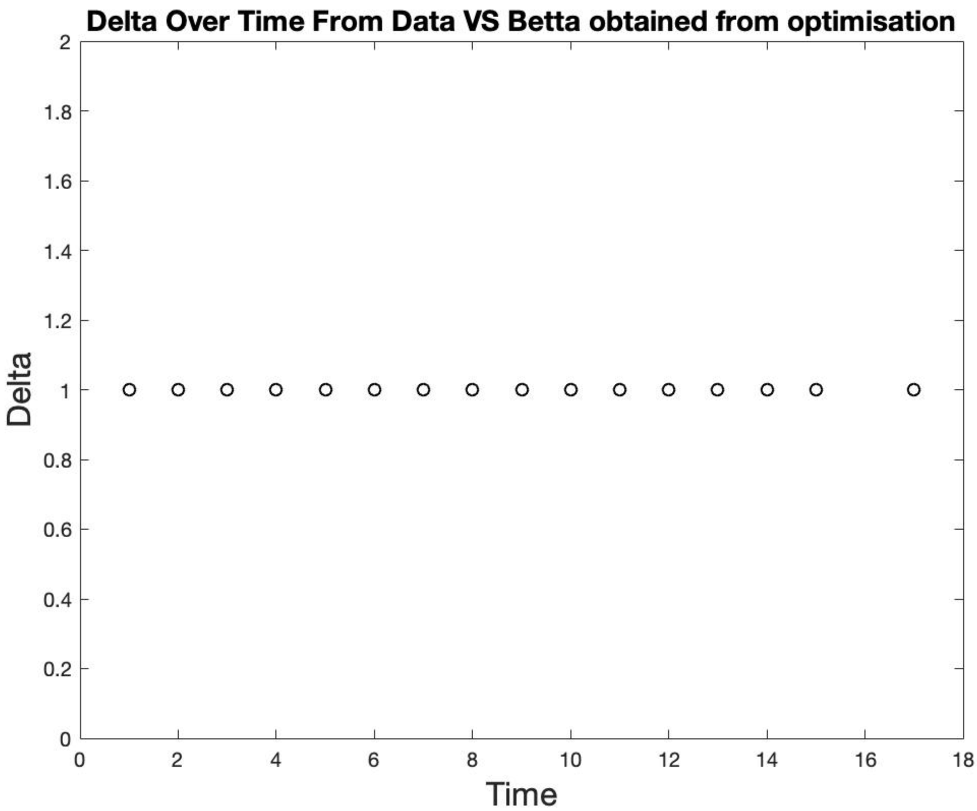
SEIR Model Fitting

The behaviours of discrete $\beta(t), \gamma(t), \delta(t)$:






Delta Over Time From Data VS Betta obtained from optimisation
Delta
Time
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2
4
6
8
10
12
14
16
18

Optimisation Stages Discussion

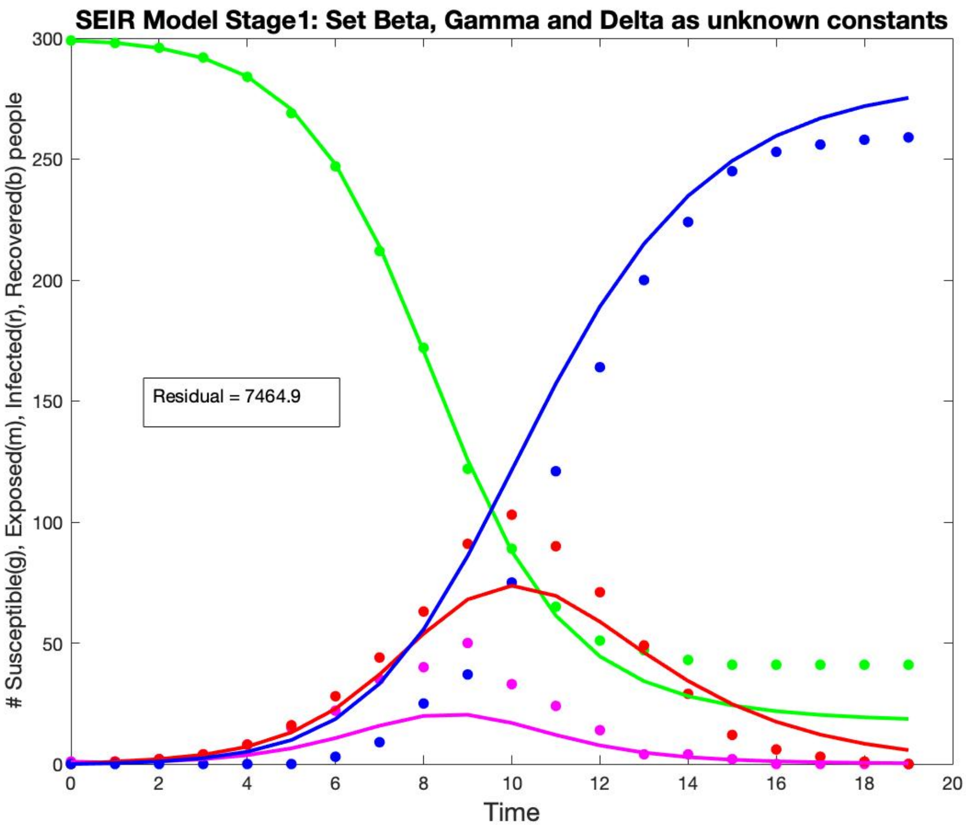
For the same set of data:

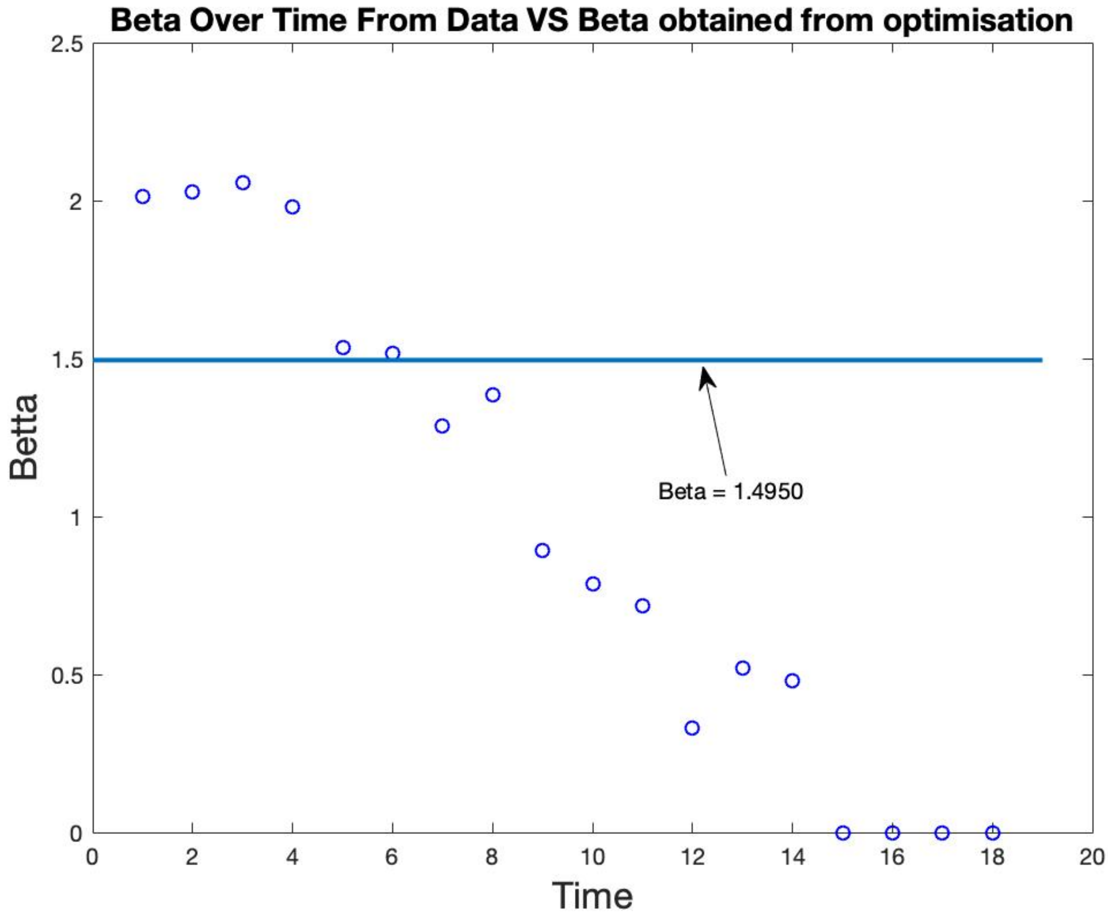
299	1	0
298	2	0
296	4	0
292	8	0
284	16	0
269	31	0
247	50	3
212	79	9
172	103	25
122	141	37
89	136	75
65	114	121
51	85	164
47	53	200
43	33	224
41	14	245
41	6	253
41	3	256
41	1	258
41	0	259

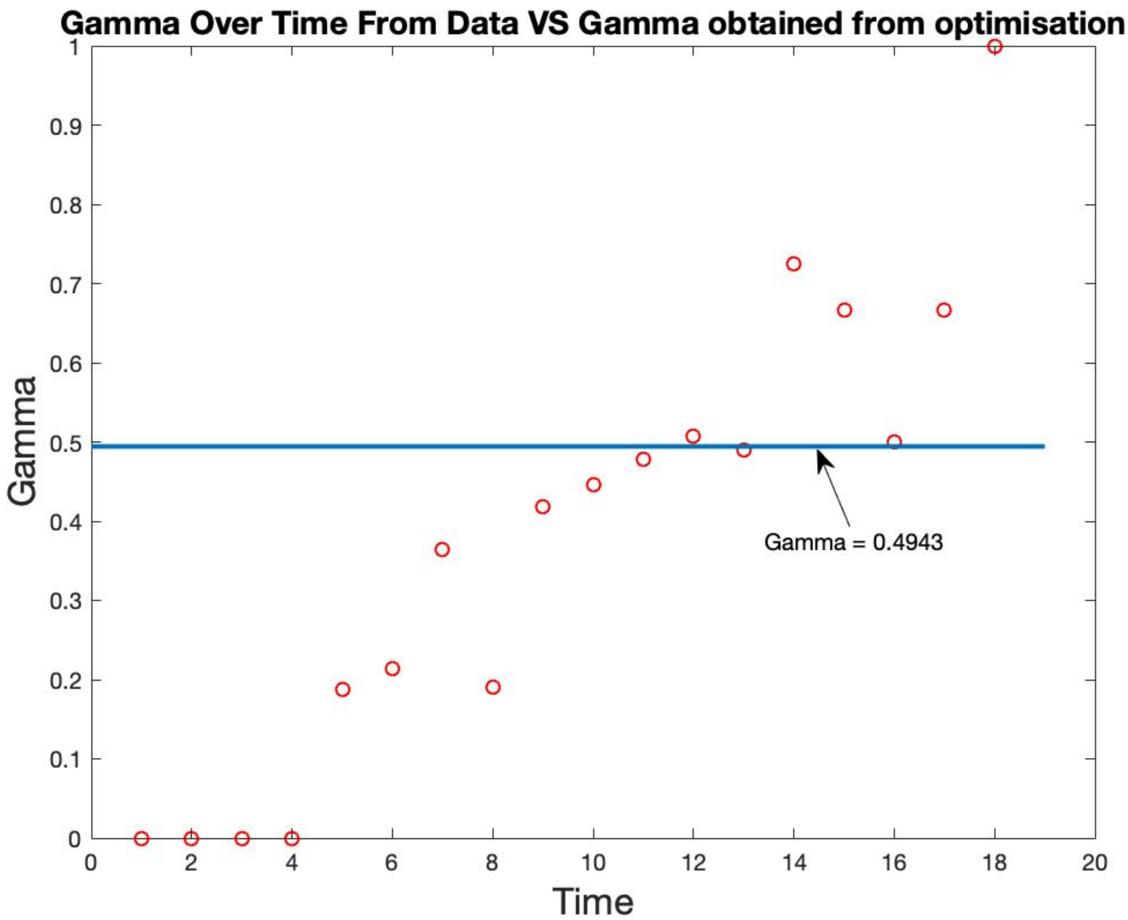
# handshakes = 10;
infectious period = 5;
# initial infected people = 1;
total # people = 300.

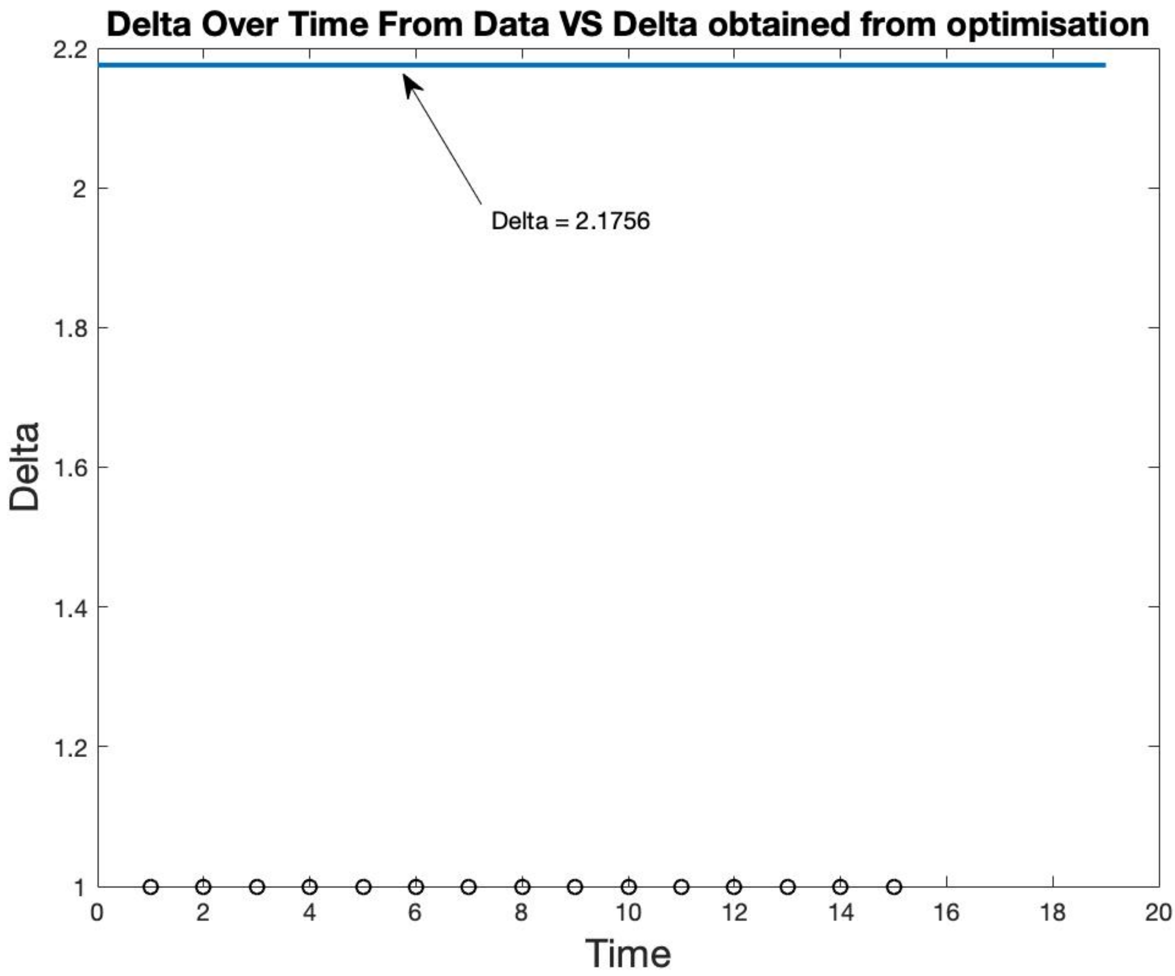
Stage 1:

Treat β, γ and δ as unknown parameters and solve for them to minimise the residual.



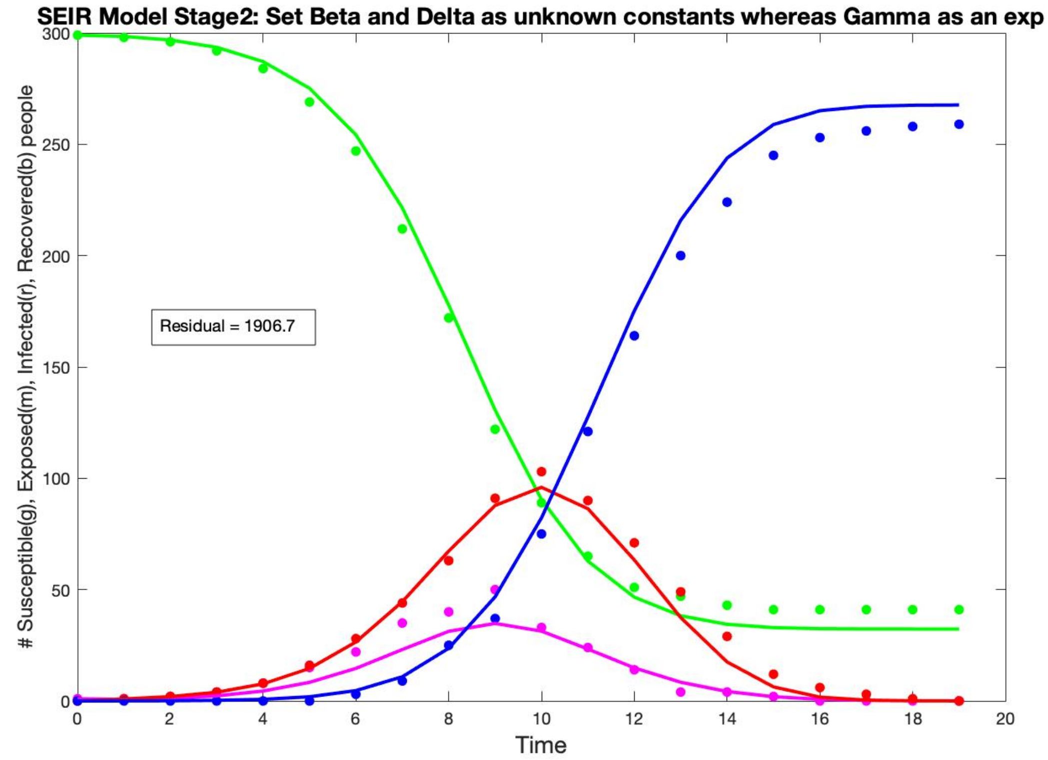

Beta Over Time From Data VS Beta obtained from optimisation
Betta
Time
Beta = 1.4950

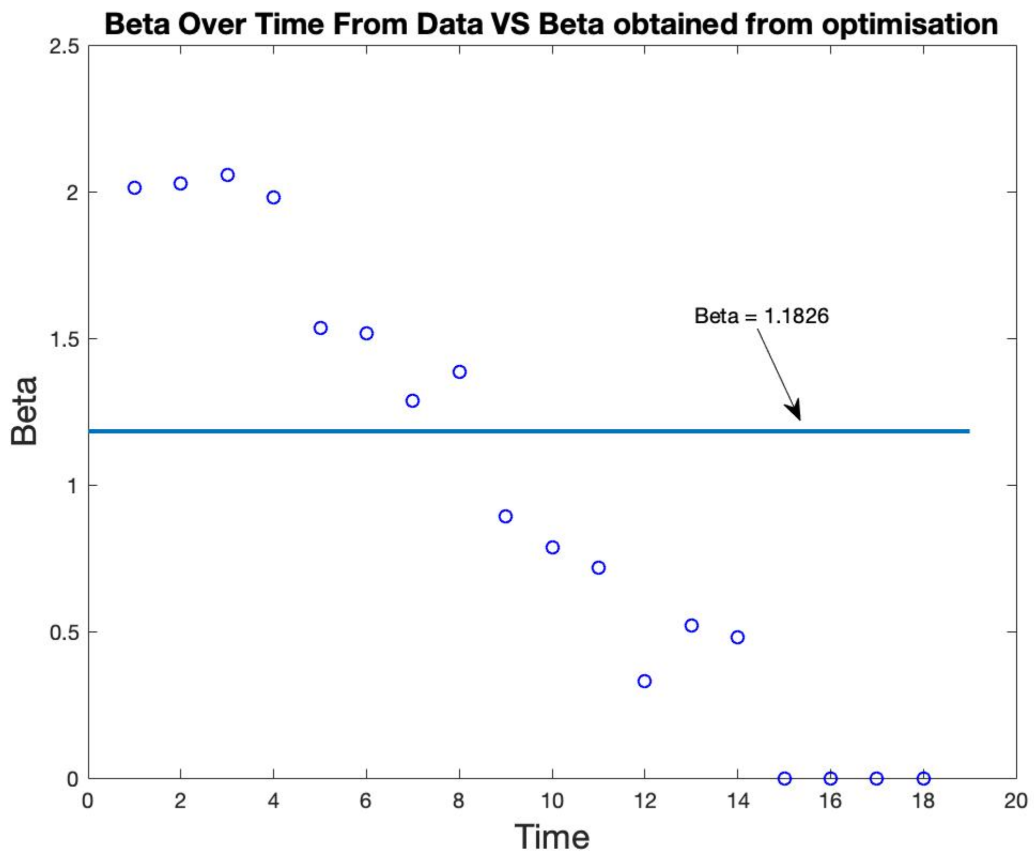

Gamma Over Time From Data VS Gamma obtained from optimisation
Gamma
Time
Gamma = 0.4943

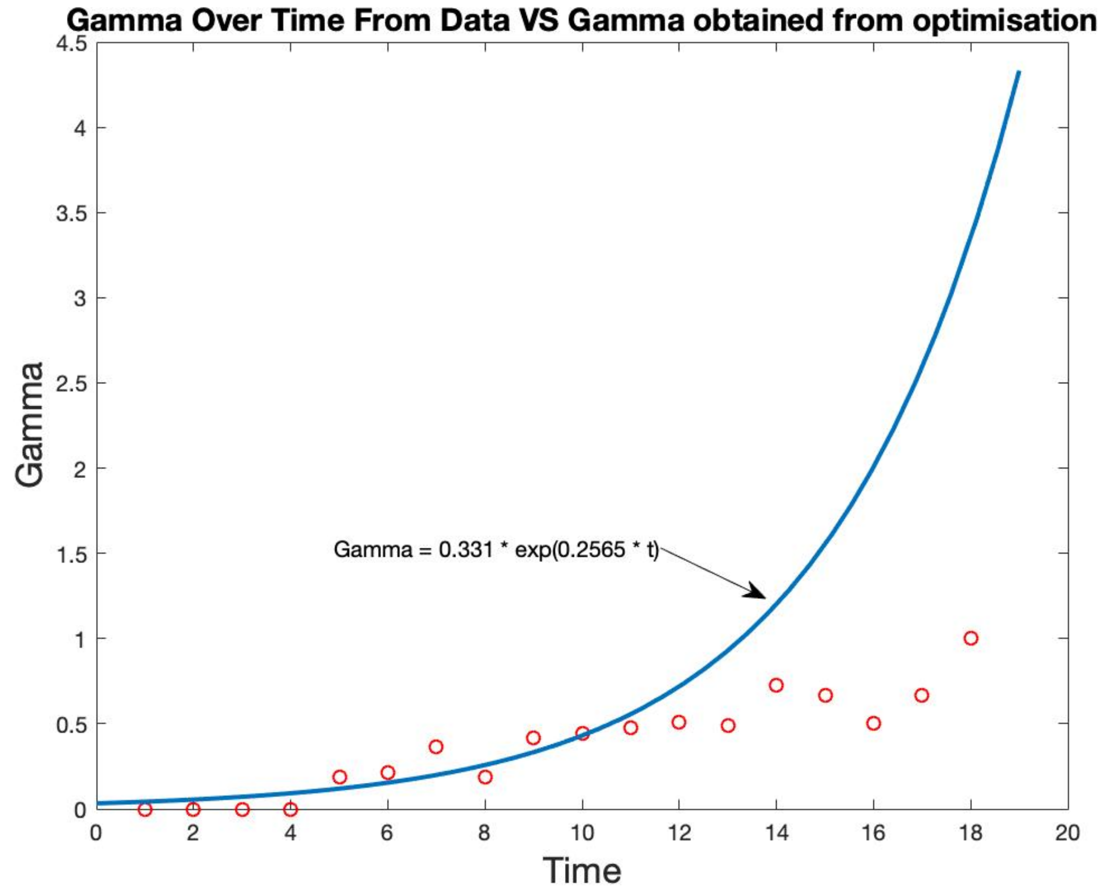

Delta Over Time From Data VS Delta obtained from optimisation
Delta = 2.1756
Delta
Time
2.2
2
1.8
1.6
1.4
1.2
1
0
2
4
6
8
10
12
14
16
18
20

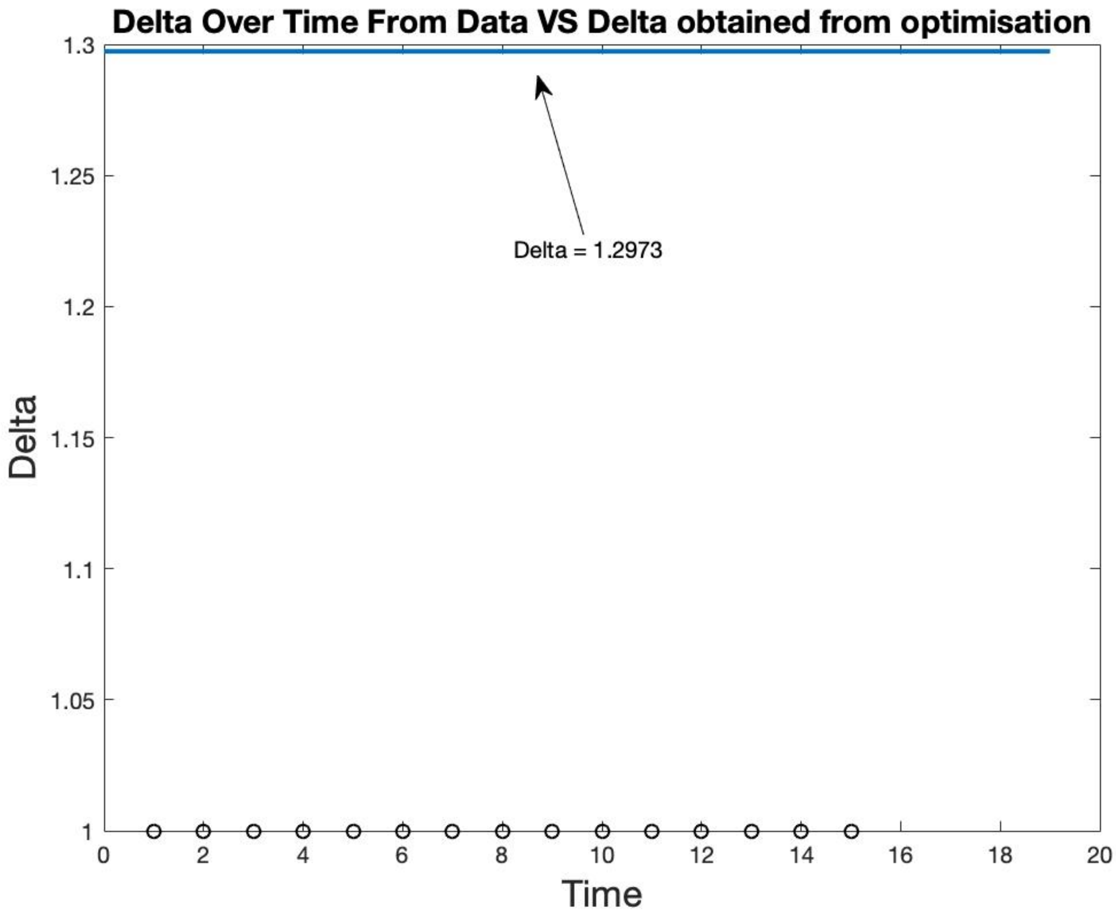
Stage 2:

Treat β and δ as unknown parameters, and $\gamma = Ae^{Bt}$ and solve for β, δ, A, B to minimise the residual.



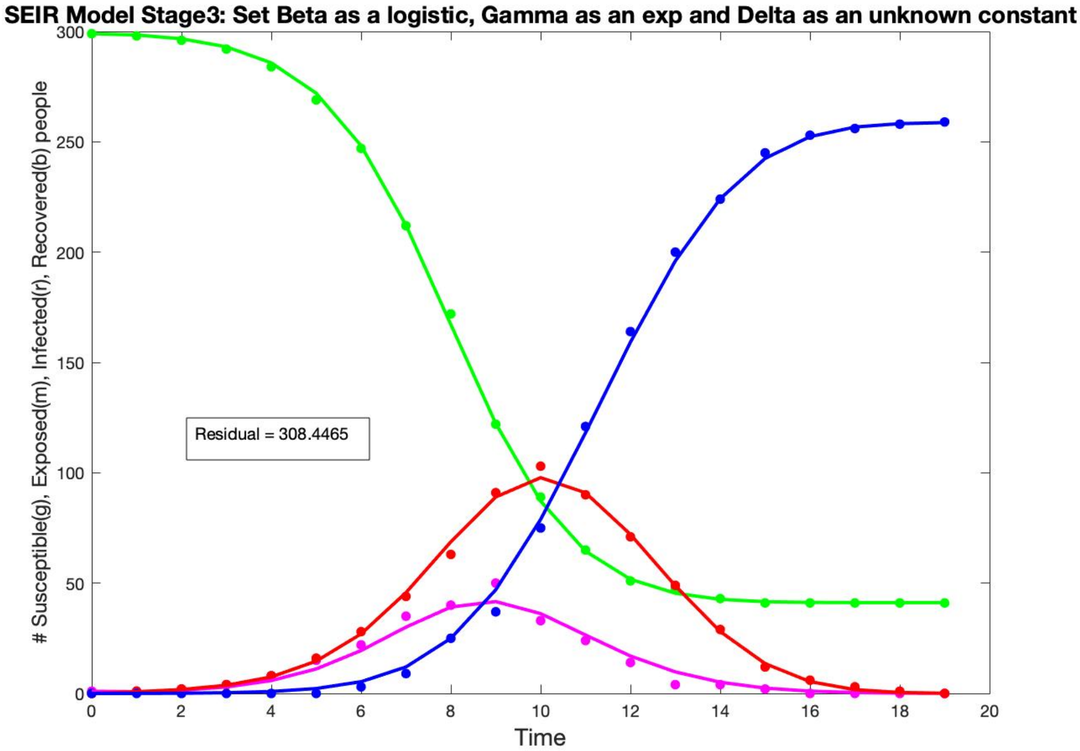


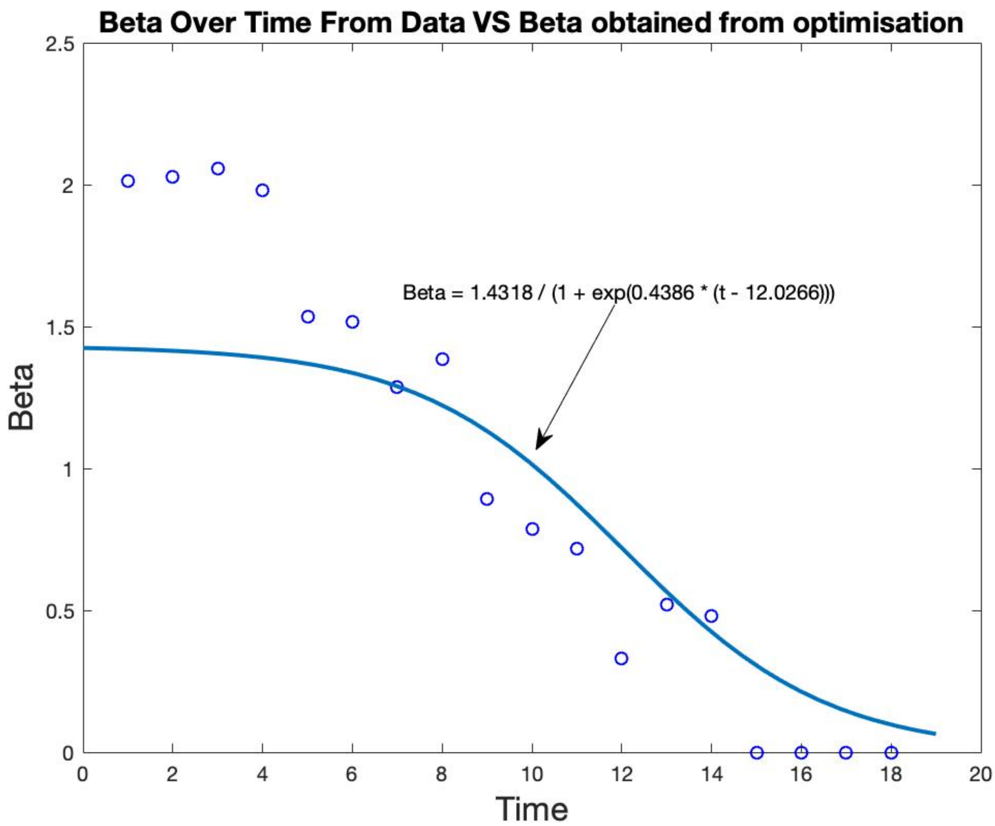

Gamma Over Time From Data VS Gamma obtained from optimisation
Gamma = 0.331 * exp(0.2565 * t)
Gamma
Time
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
2
4
6
8
10
12
14
16
18
20

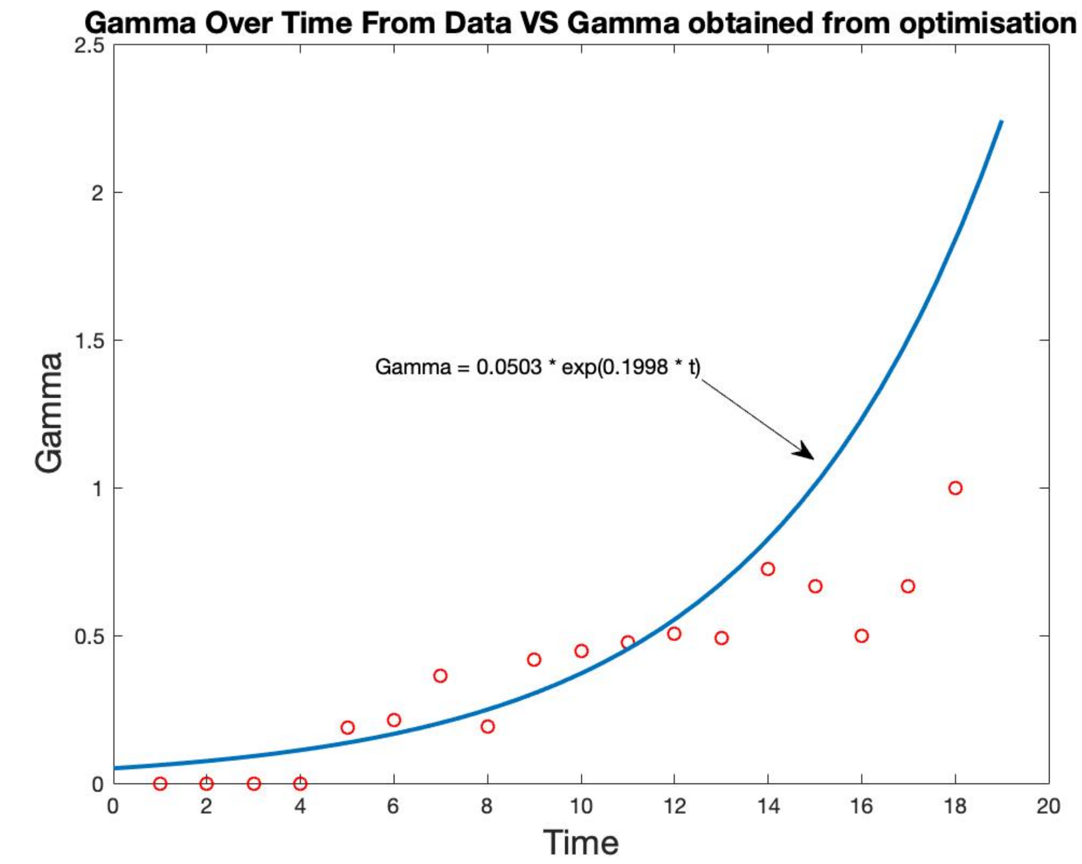

Delta Over Time From Data VS Delta obtained from optimisation
Delta = 1.2973
Delta
Time
1
1.05
1.1
1.15
1.2
1.25
1.3
0
2
4
6
8
10
12
14
16
18
20

Stage 3:

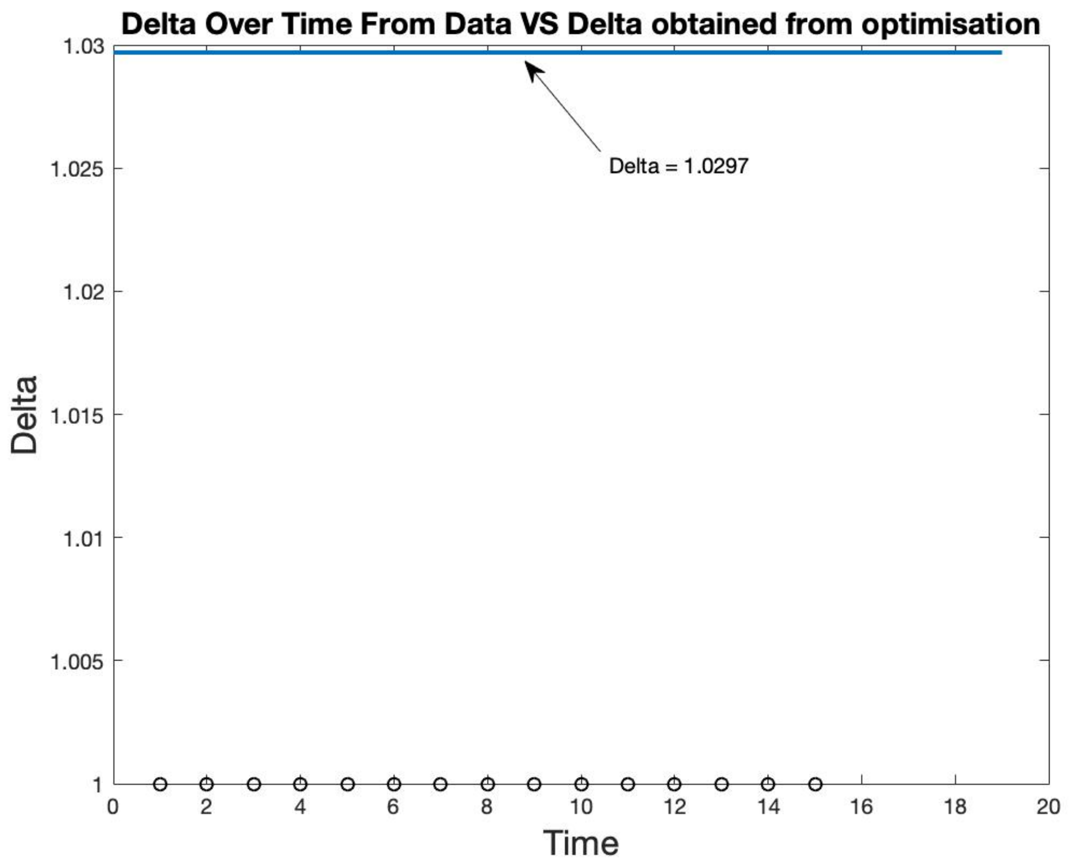
Treat δ as an unknown parameter, $\beta = \dfrac{L}{1 + e^{k(t-t_0)}}$, and $\gamma = Ae^{Bt}$. Solve for L, k, t_0, A, B, δ to minimise the residual.







Gamma Over Time From Data VS Gamma obtained from optimisation
Gamma = 0.0503 * exp(0.1998 * t)
Gamma
Time
0
0.5
1
1.5
2
2.5
0
2
4
6
8
10
12
14
16
18
20



Delta Over Time From Data VS Delta obtained from optimisation
Delta = 1.0297
Delta
Time
1
1.005
1.01
1.015
1.02
1.025
1.03
0
2
4
6
8
10
12
14
16
18
20