
10 APPENDIX II

This section presents the validation results of the dynamic traffic assignment parameters based on a standard comparison between model and system outputs for all models.

10.1 VITORIA MODEL

10.1.1 EXPERIMENT DESCRIPTION

This section presents the validation results of dynamic traffic assignment parameters based on a standard comparison between model and system outputs for a medium-sized urban network that models a part of the city of Vitoria in Spain.

The set of real traffic data comprises traffic counts gathered at 10 detector stations from 4 April 1999 to 19 May 1999. The level of aggregation was 15 minutes over 24 hours. From the data, we considered only working days and the afternoon peak hour (from 18:00 to 19:00) and calculated the average traffic count for each detector.

Depending on the route choice model employed (proportional, logit or C-logit), the experimental design factors for the simulations were as follows:

- Proportional route choice model:
 - Alpha factor, for which values of 0.5, 1, 2 and 3 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 2, 3 and 4 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The following random seeds were changed: 9182, 1670, 6534, 8159, 8538, 5768, 1277, 1065, 1846, 8740, 1489, 3334, 6232, 6237 and 1870.

- Logit route choice model:
 - Scale factor, for which values of 10, 60, 100 and 600 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 2, 3 and 4 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

- C-logit route choice model with fixed beta and gamma:
 - Scale factor, for which values of 10, 60, 100 and 600 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 2, 3 and 4 were considered
 - Beta fixed to 0.15
 - Gamma fixed to 1

- If these factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model. C-logit route choice model with varying beta and gamma:
 - Scale factor fixed to 60
 - *Initial K-SP* fixed to 2
 - Maximum number of routes fixed to 4
 - Beta, for which values of 0.10, 0.15, 0.50 and 1 were considered
 - Gamma, for which values of 0.5, 1, 1.5 and 2 were considered

If these factors are combined, the total number of experiments is 16 ($4 * 4$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

10.1.2 EXPERIMENT RESULTS

10.1.2.1 PROPORTIONAL ROUTE CHOICE

Table 10.1 shows the GEH index and R^2 of the average replication of all the experiments for which the proportional route choice function was used.

Experiment Number	Proportional			Global GEH	R^2
	Alpha Factor	<i>Initial K-SP</i>	<i>Max Number of Routes</i>		
1	0.5	1	2	75.0%	56.68%
2	0.5	1	3	72.5%	51.82%
3	0.5	1	4	70.0%	46.52%
4	0.5	2	2	75.0%	58.86%

5	0.5	2	3	67.5%	43.82%
6	0.5	2	4	65.0%	37.55%
7	0.5	3	2	77.5%	63.80%
8	0.5	3	3	67.5%	46.57%
9	0.5	3	4	67.5%	39.99%
10	1	1	2	75.0%	59.09%
11	1	1	3	80.0%	56.97%
12	1	1	4	70.0%	53.62%
13	1	2	2	85.0%	64.35%
14	1	2	3	75.0%	51.45%
15	1	2	4	72.5%	45.74%
16	1	3	2	77.5%	63.80%
17	1	3	3	67.5%	46.57%
18	1	3	4	67.5%	39.99%
19	2	1	2	77.5%	64.04%
20	2	1	3	80.0%	62.64%
21	2	1	4	80.0%	61.58%
22	2	2	2	85.0%	67.75%
23	2	2	3	72.5%	56.96%
24	2	2	4	75.0%	55.07%
25	2	3	2	87.5%	70.64%
26	2	3	3	82.5%	64.56%
27	2	3	4	75.0%	58.24%
28	3	1	2	77.5%	65.58%
29	3	1	3	77.5%	66.47%
30	3	1	4	77.5%	64.12%
31	3	2	2	85.0%	70.41%
32	3	2	3	82.5%	64.52%
33	3	2	4	82.5%	63.79%
34	3	3	2	82.5%	72.47%
35	3	3	3	87.5%	69.09%
36	3	3	4	82.5%	65.68%

Table 10.1. Proportional route choice model

Figure 10.1 depicts the GEH index of all the experiments in which the proportional route choice model was used, which can be rejected or accepted on the basis of whether the values of GEH are greater than 85%.

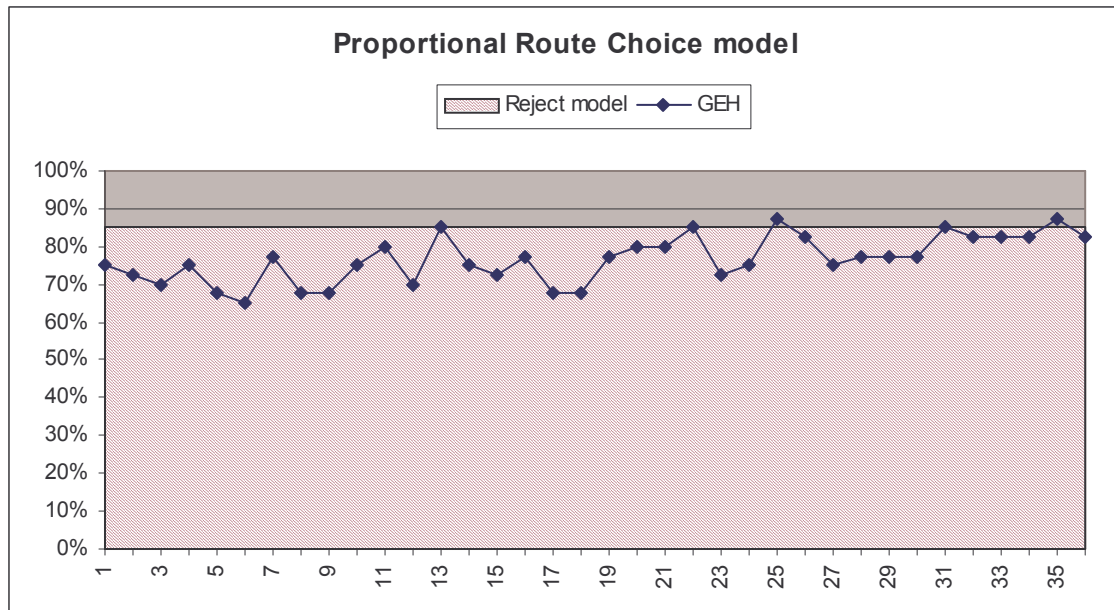


Figure 10.1. Validation of the proportional route choice model using GEH criteria

Figure 10.2, Figure 10.3 and Figure 10.4 show the influence of each route choice parameter when a proportional route choice model was used.

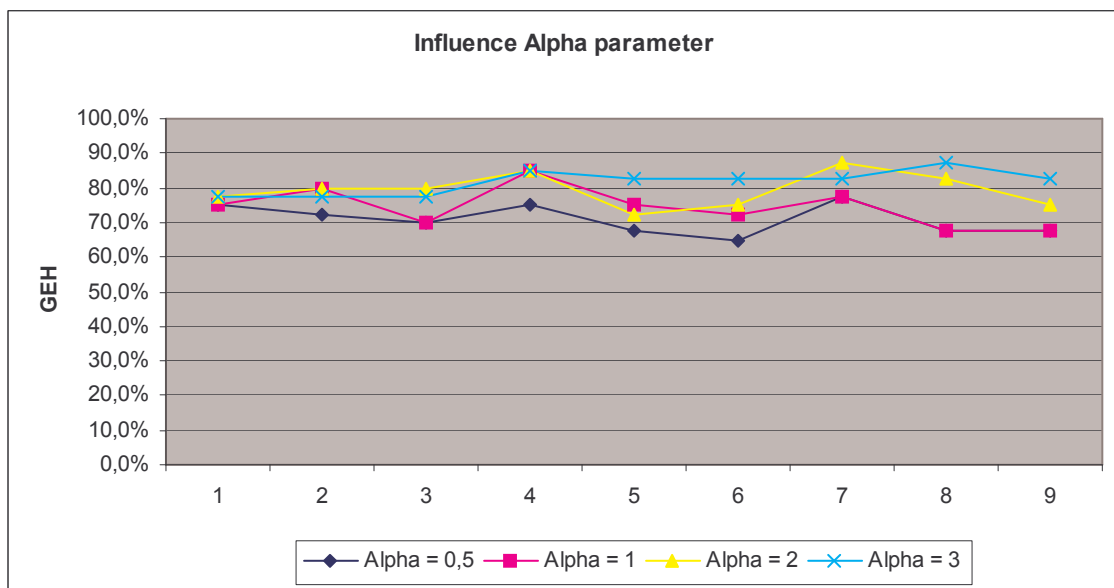


Figure 10.2. Influence of the alpha parameter in proportional route choice model

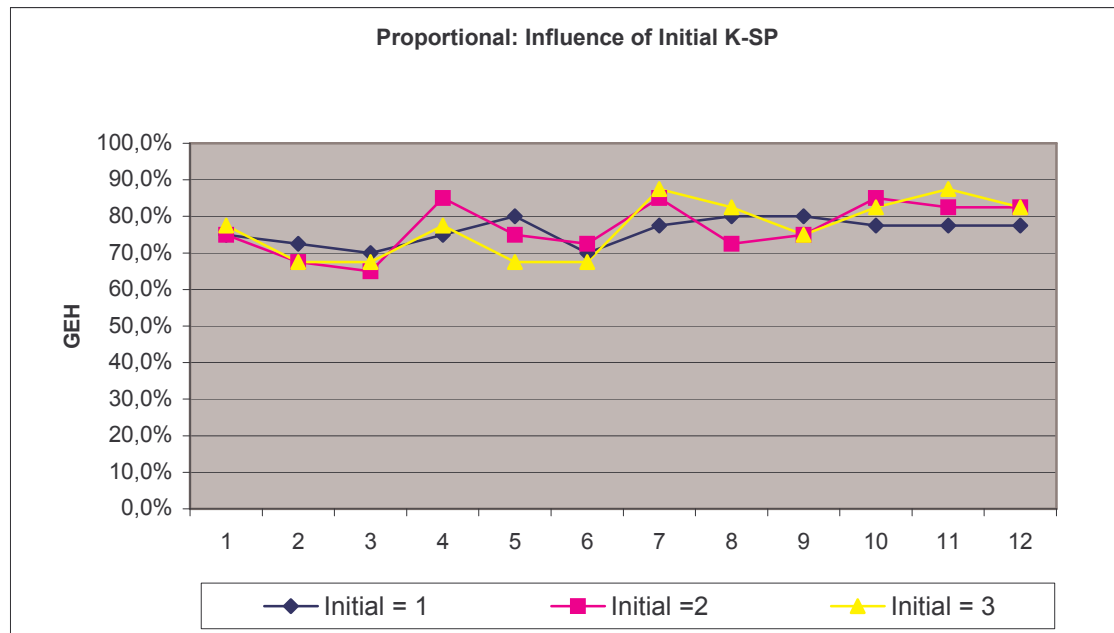


Figure 10.3. Influence of the Initial K-SP parameter in the proportional route choice model

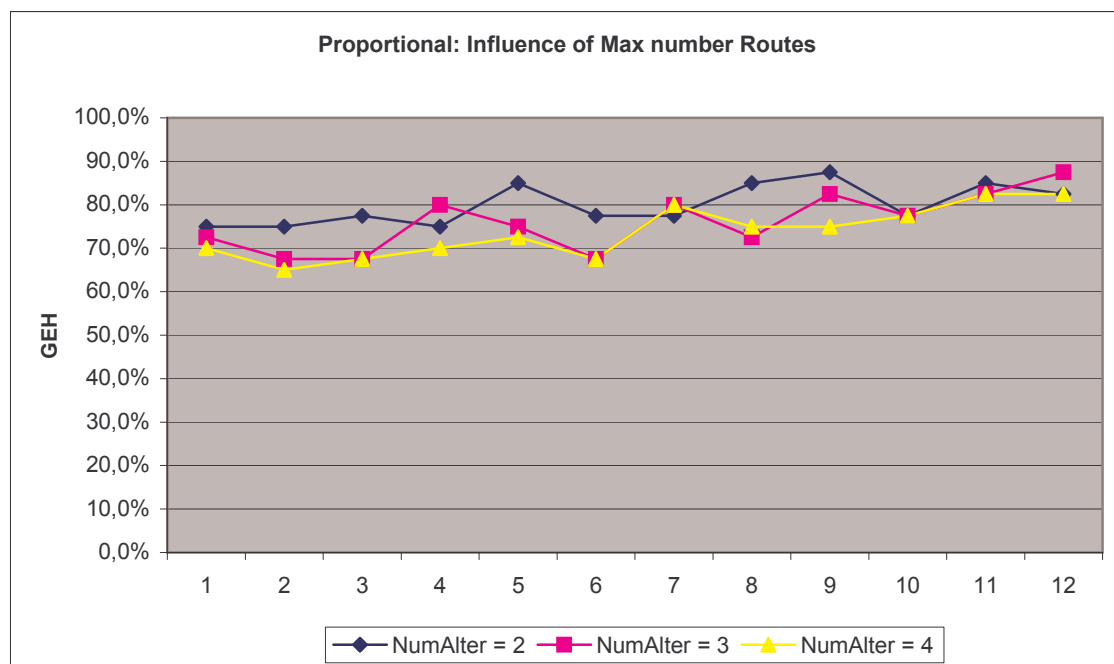


Figure 10.4. Influence of the maximum number of routes in the proportional route choice model

10.1.2.2 LOGIT ROUTE CHOICE

Table 10.2 shows the GEH index and R^2 value of all experiments with the logit route choice model.

Experiment Number	Logit		Max Number of Routes	Global GEH	R ²
	Scale Factor	Initial K-SP			
1	10	1	2	77.5%	66.0%
2	10	1	3	77.5%	63.0%
3	10	1	4	77.5%	62.6%
4	10	2	2	85.0%	71.6%
5	10	2	3	77.5%	62.0%
6	10	2	4	77.5%	62.0%
7	10	3	2	90.0%	74.5%
8	10	3	3	87.5%	70.0%
9	10	3	4	82.5%	66.0%
10	60	1	2	77.5%	72.3%
11	60	1	3	82.5%	73.3%
12	60	1	4	82.5%	73.1%
13	60	2	2	85.0%	74.9%
14	60	2	3	82.5%	74.8%
15	60	2	4	82.5%	74.7%
16	60	3	2	85.0%	75.7%
17	60	3	3	82.5%	75.3%
18	60	3	4	85.0%	75.0%
19	100	1	2	80.0%	72.7%
20	100	1	3	85.0%	73.7%
21	100	1	4	80.0%	73.1%
22	100	2	2	85.0%	75.1%
23	100	2	3	82.5%	74.5%
24	100	2	4	87.5%	74.6%
25	100	3	2	85.0%	75.1%
26	100	3	3	82.5%	75.6%
27	100	3	4	85.0%	75.1%
28	600	1	2	80.0%	73.2%
29	600	1	3	85.0%	74.1%
30	600	1	4	87.5%	73.8%
31	600	2	2	87.5%	75.4%
32	600	2	3	90.0%	75.6%
33	600	2	4	90.0%	75.2%
34	600	3	2	87.5%	74.6%
35	600	3	3	87.5%	75.7%
36	600	3	4	87.5%	75.6%

Table 10.2. Logit Route Choice Model

Figure 10.5 depicts the GEH index of all the experiments in which the logit route choice model was used, which can be rejected or accepted on the basis of whether the values of GEH are greater than 85%.

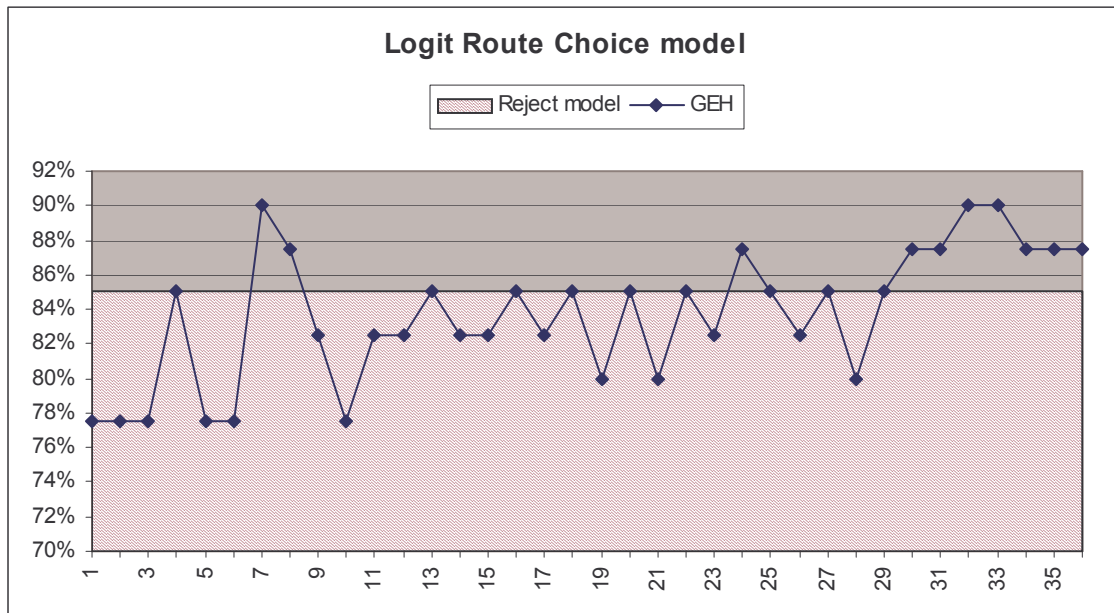


Figure 10.5. Validation of the logit route choice model using GEH criteria

Figure 10.6, Figure 10.7 and Figure 10.8 show the influence of each route choice parameter when a logit route choice model was used.

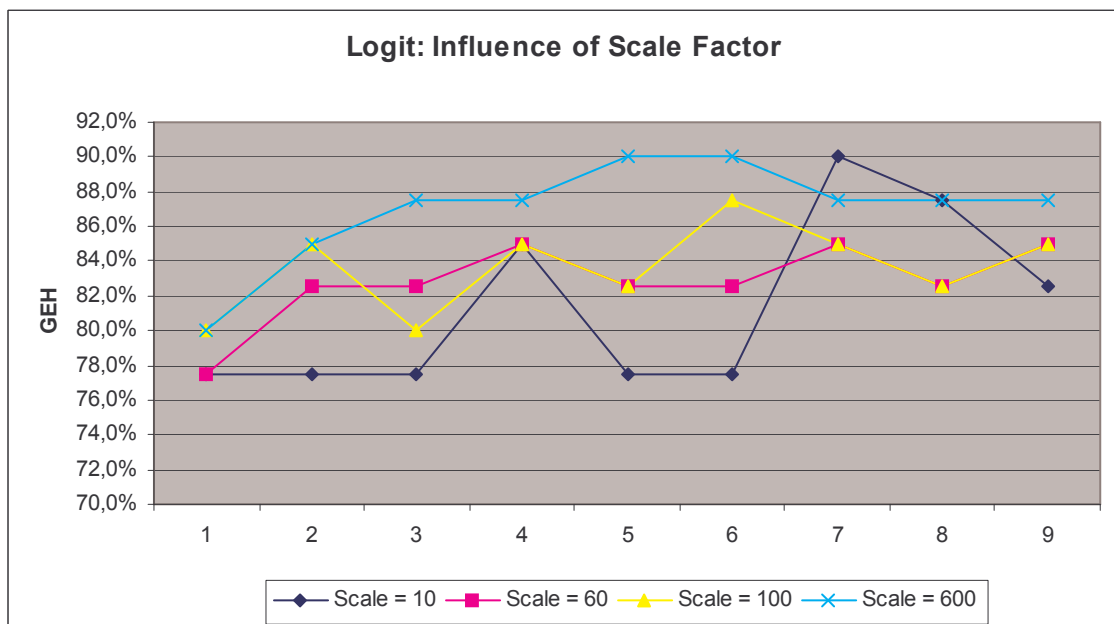


Figure 10.6. Influence of the scale factor parameter in the logit route choice model

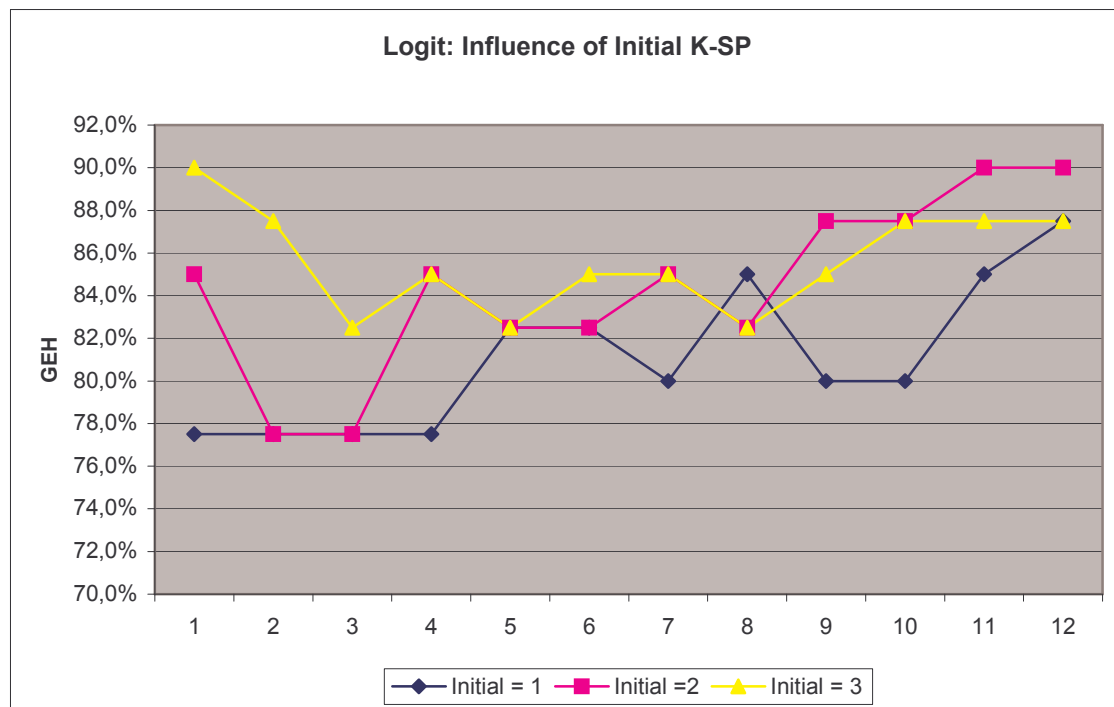


Figure 10.7. Influence of the Initial K-SP parameter in the logit route choice model

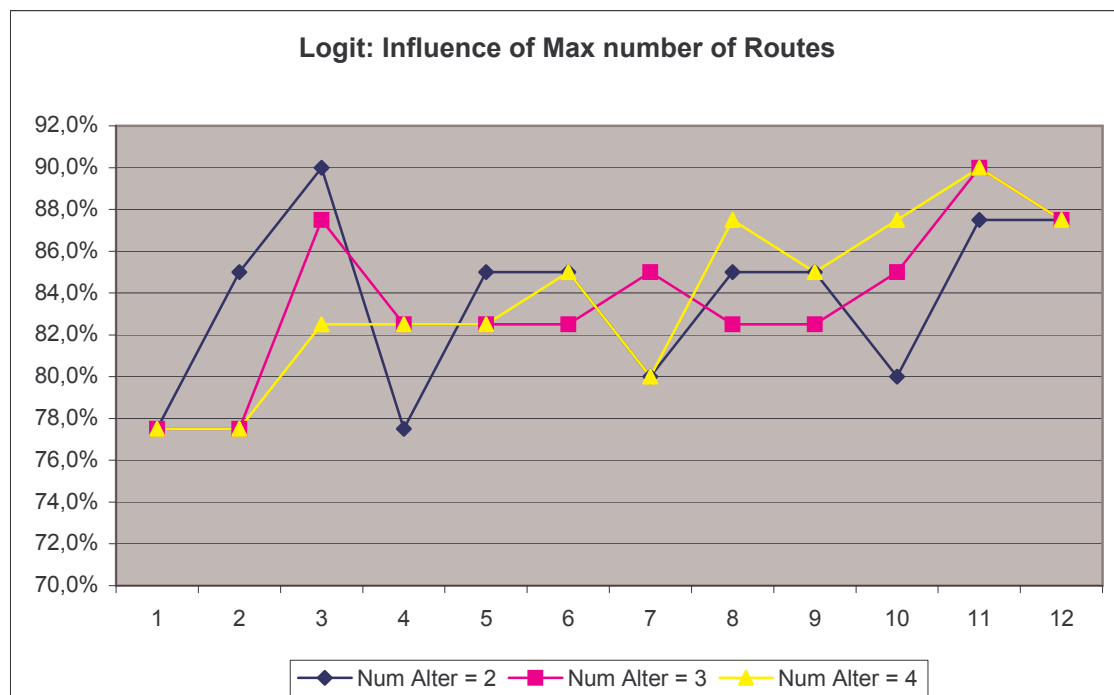


Figure 10.8. Influence of the maximum number of routes parameter in the logit route choice model

10.1.2.3 C-LOGIT ROUTE CHOICE WITH FIXED BETA AND GAMMA

Table 10.3 shows the GEH index and R^2 value of all the experiments in which the C-logit route choice model was used and beta and gamma were fixed to 0.15 and 1.0 respectively.

Experiment Number	C-Logit		Max Number of Routes	Global GEH	R^2
	Scale Factor	Initial K-SP			
1	10	1	3	86.7%	93.4%
2	10	1	4	86.7%	93.2%
3	10	1	5	80.0%	92.9%
4	10	2	3	80.0%	93.6%
5	10	2	4	80.0%	93.4%
6	10	2	5	80.0%	93.2%
7	10	3	3	76.7%	93.5%
8	10	3	4	76.7%	92.7%
9	10	3	5	76.7%	92.8%
10	60	1	3	83.3%	92.9%
11	60	1	4	86.7%	93.1%
12	60	1	5	83.3%	92.5%
13	60	2	3	83.3%	93.8%
14	60	2	4	83.3%	93.6%
15	60	2	5	86.7%	93.5%
16	60	3	3	83.3%	93.5%
17	60	3	4	83.3%	93.5%
18	60	3	5	83.3%	92.7%
19	100	1	3	83.3%	91.1%
20	100	1	4	76.7%	91.1%
21	100	1	5	83.3%	91.6%
22	100	2	3	83.3%	93.5%
23	100	2	4	86.7%	93.0%
24	100	2	5	86.7%	92.9%
25	100	3	3	76.7%	91.6%
26	100	3	4	83.3%	93.3%
27	100	3	5	73.3%	92.4%
28	600	1	3	73.3%	88.8%
29	600	1	4	80.0%	91.0%
30	600	1	5	76.7%	89.9%

31	600	2	3	83.3%	92.9%
32	600	2	4	86.7%	92.9%
33	600	2	5	80.0%	92.8%
34	600	3	3	73.3%	91.5%
35	600	3	4	73.3%	91.4%
36	600	3	5	80.0%	92.1%

Table 10.3. C-Logit Route Choice Model with fixed Beta and Gamma

Figure 10.9 depicts the GEH of all the experiments in which the C-logit route choice model was used, which can be rejected or accepted on the basis of whether the values of GEH are greater than 85%.

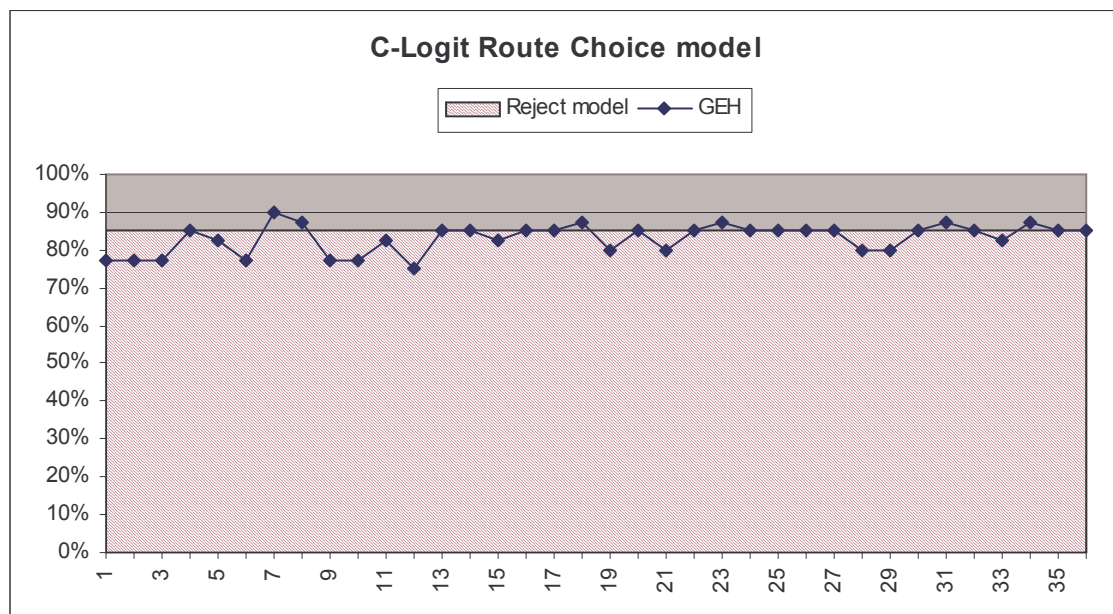


Figure 10.9. Validation of C-logit route choice model using GEH criteria

Figure 10.10, Figure 10.11 and Figure 10.12 show the influence of each route choice parameter when a C-logit route choice model was used.

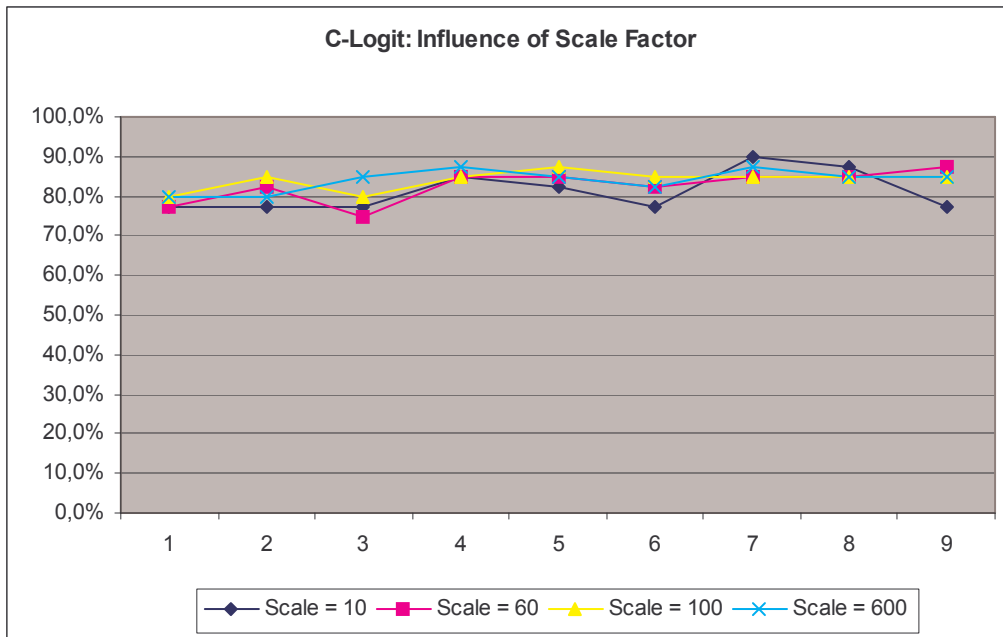


Figure 10.10. Influence of the scale factor parameter in the C-logit route choice model

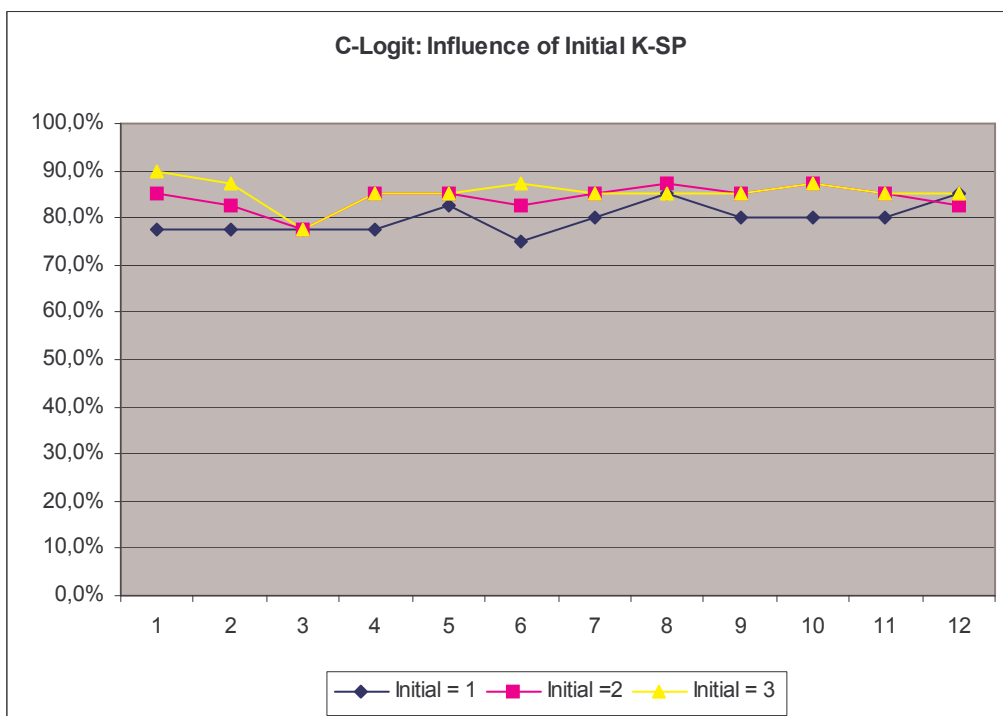


Figure 10.11. Influence of the Initial K-SP parameter in the logit route choice model

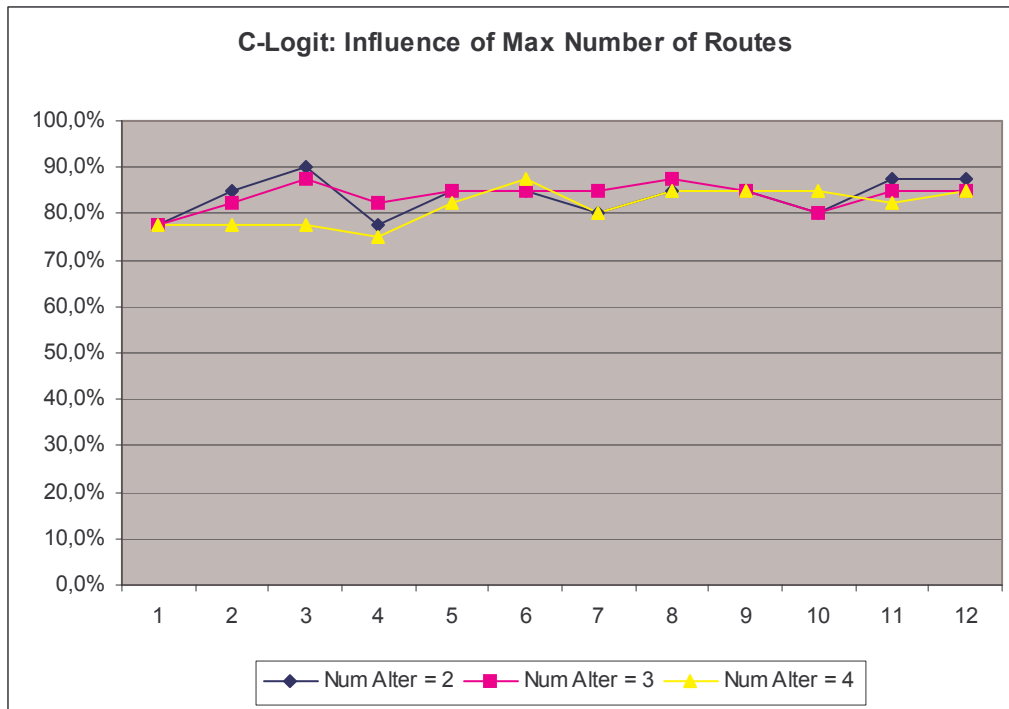


Figure 10.12. Influence of the maximum number of routes parameter in the logit route choice model

10.1.2.4 C-LOGIT ROUTE CHOICE WITH VARYING BETA AND GAMMA

Table 10.4 shows the GEH index and R^2 value of all the experiments in which the C-logit route choice model was used, the values of beta and gamma varied, the scale factor was fixed to 60, *Initial K-SP* was fixed to 2 and the *Max number of Routes* was fixed to 4.

Experiment Number	C-Logit			
	Beta	Gamma	Global GEH	R^2
1	0,10	0.5	85.0%	75.0%
2	0,10	1,0	82.5%	75.3%
3	0,10	1,5	85.0%	75.1%
4	0,10	2,0	82.5%	74.4%
5	0,15	0.5	87.5%	75.4%
6	0,15	1,0	82.5%	74.6%
7	0,15	1,5	85.0%	74.2%
8	0,15	2,0	82.5%	73.3%
9	0,50	0.5	80.0%	71.3%
10	0,50	1,0	77.5%	70.8%
11	0,50	1,5	70.0%	66.9%

12	0,50	2,0	70.0%	68.5%
13	1,00	0.5	70.0%	59.3%
14	1,00	1,0	70.0%	59.1%
15	1,00	1,5	72.5%	62.8%
16	1,00	2,0	72.5%	61.1%

Table 10.4. C-Logit route choice model varying beta and gamma

Figure 10.13 depicts GEH of all experiments with varying beta and gamma with C-logit as the route choice model.

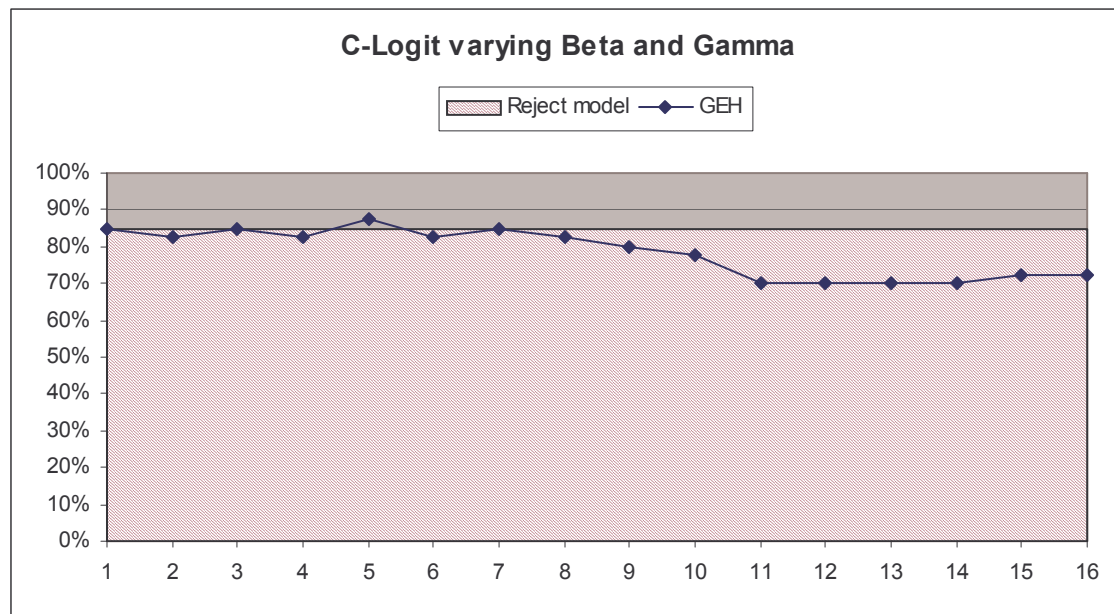


Figure 10.13. Validation of the C-logit route choice model, in which beta and gamma varied and GEH criteria were used

Figure 10.14 and Figure 10.15 show the influence of each route choice parameter when a C-logit route choice model was used.

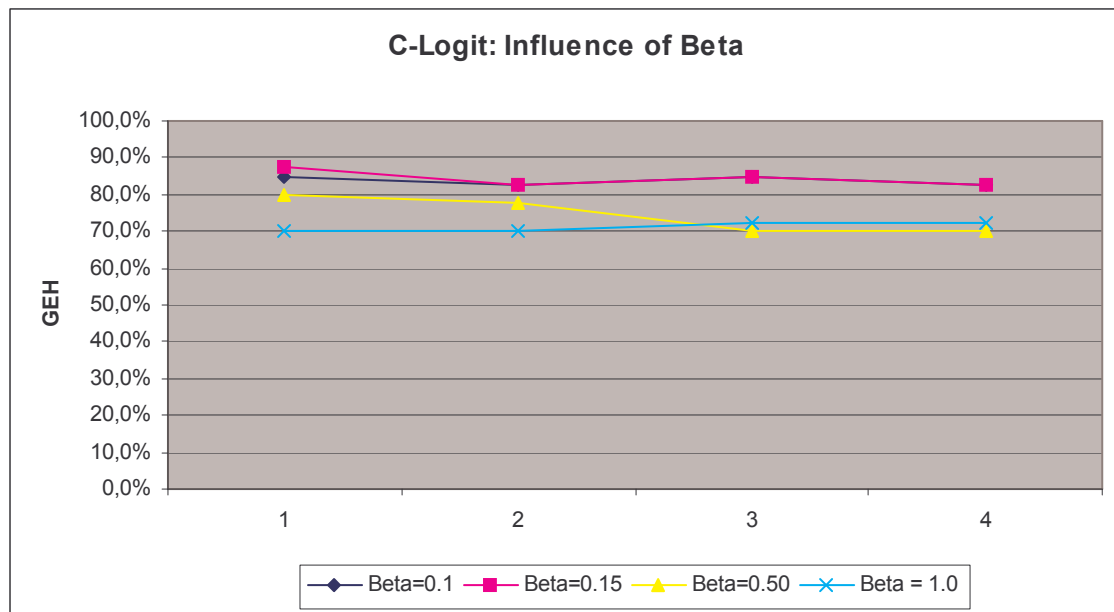


Figure 10.14. Influence of beta in the C-logit route choice model

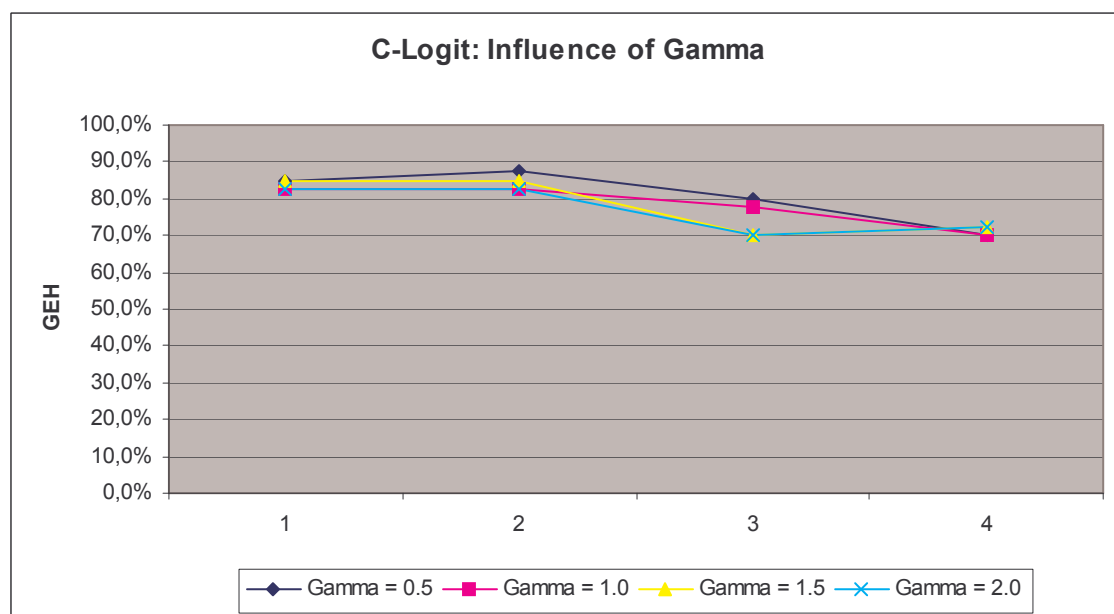


Figure 10.15. Influence of gamma in the C-logit route choice model

10.2 AMARA MODEL

10.2.1 EXPERIMENT DESCRIPTION

The set of real traffic data comprises traffic counts gathered at 15 detector stations from 4 April 1999 to 19 May 1999. The level of aggregation was of 1 hour over 24 hours. From the data, we considered only working days and the afternoon peak time (from 18:00 to 20:00) and calculated the average traffic count for each detector. The experiment was carried out to analyse the influence of each dynamic traffic assignment parameter on the model and system outputs.

Depending on the route choice model employed (proportional, logit or C-logit), the experimental design factors for the simulations were as follows:

- Proportional route choice model:
 - Alpha factor, for which values of 0.5, 1, 2 and 3 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 3, 4 and 5 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The following random seeds were changed: 9182, 1670, 6534, 8159, 8538, 5768, 1277, 1065, 1846, 8740, 1489, 3334, 6232, 6237 and 1870.

- Logit route choice model:
 - Scale factor, for which values of 10, 60, 100 and 600 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 3, 4 and 5 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

- C-logit route choice model with fixed beta and gamma:
 - Scale factor, for which values of 10, 60, 100 and 600 were considered

- *Initial K-SP*, for which values of 1, 2 and 3 were considered
- Maximum number of routes, for which values of 3, 4 and 5 were considered
- Beta fixed to 0.15
- Gamma fixed to 1

If these factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

C-logit route choice model with varying beta and gamma:

- Scale factor fixed to 60
- *Initial K-SP* fixed to 2
- Maximum number of routes fixed to 3 were considered
- Beta, for which values of 0.10, 0.15, 0.50 and 1 were considered
- Gamma, for which values of 0.5, 1, 1.5 and 2 were considered

If these factors are combined, the total number of experiments is 16 ($4 * 4$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

10.2.2 EXPERIMENT RESULTS

In the following sections, we analyse the experiments, which have been grouped by route choice function.

10.2.2.1 PROPORTIONAL ROUTE CHOICE

Table 10.5 shows the GEH index and R^2 of the average replication of all the experiments for which the proportional route choice function was used

Experiment Number	Proportional		Max Number of Routes	Global GEH	R^2
	Alpha Factor	Initial K-SP			
1	0,5	1	3	76.7%	91.3%
2	0,5	1	4	80.0%	91.0%
3	0,5	1	5	80.0%	90.9%
4	0,5	2	3	40.0%	76.3%

5	0,5	2	4	43.3%	74.3%
6	0,5	2	5	33.3%	66.5%
7	0,5	3	3	56.7%	76.9%
8	0,5	3	4	33.3%	75.4%
9	0,5	3	5	30.0%	74.2%
10	1	1	3	80.0%	92.4%
11	1	1	4	80.0%	92.5%
12	1	1	5	80.0%	91.9%
13	1	2	3	80.0%	92.8%
14	1	2	4	73.3%	92.2%
15	1	2	5	73.3%	92.5%
16	1	3	3	66.7%	89.9%
17	1	3	4	70.0%	89.6%
18	1	3	5	66.7%	86.2%
19	2	1	3	86.7%	93.4%
20	2	1	4	83.3%	92.9%
21	2	1	5	83.3%	93.1%
22	2	2	3	83.3%	93.9%
23	2	2	4	83.3%	94.0%
24	2	2	5	83.3%	93.8%
25	2	3	3	83.3%	93.5%
26	2	3	4	80.0%	93.4%
27	2	3	5	76.7%	93.6%
28	3	1	3	86.7%	93.9%
29	3	1	4	86.7%	93.5%
30	3	1	5	86.7%	93.8%
31	3	2	3	83.3%	94.4%
32	3	2	4	83.3%	94.2%
33	3	2	5	83.3%	94.4%
34	3	3	3	80.0%	93.8%
35	3	3	4	83.3%	94.4%
36	3	3	5	83.3%	94.3%

Table 10.5. Proportional route choice model

Figure 10.16 depicts the GEH of all the experiments in which the proportional route choice model was used.

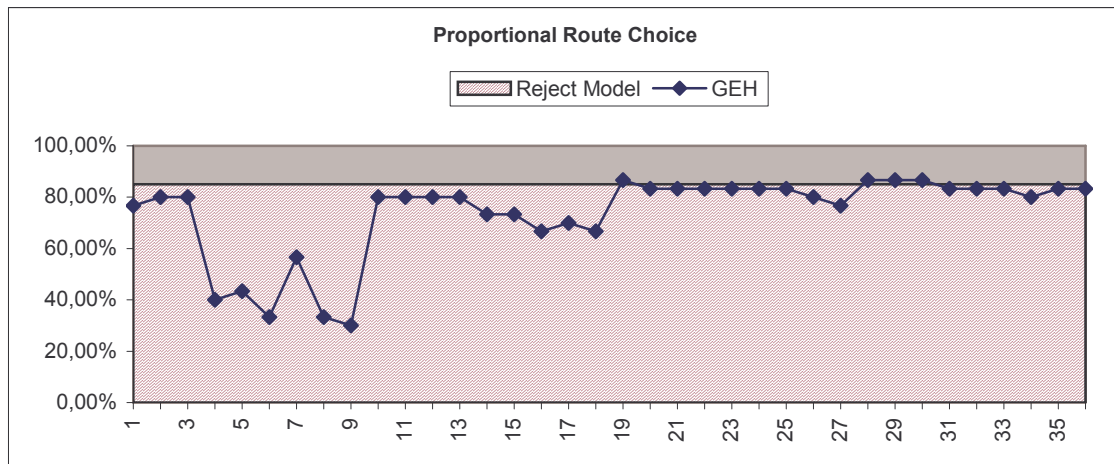


Figure 10.16. Validation of the proportional route choice model using GEH criteria

Figure 10.17, Figure 10.18, and Figure 10.19 show the influence of each route choice parameter when the proportional route choice model was used.

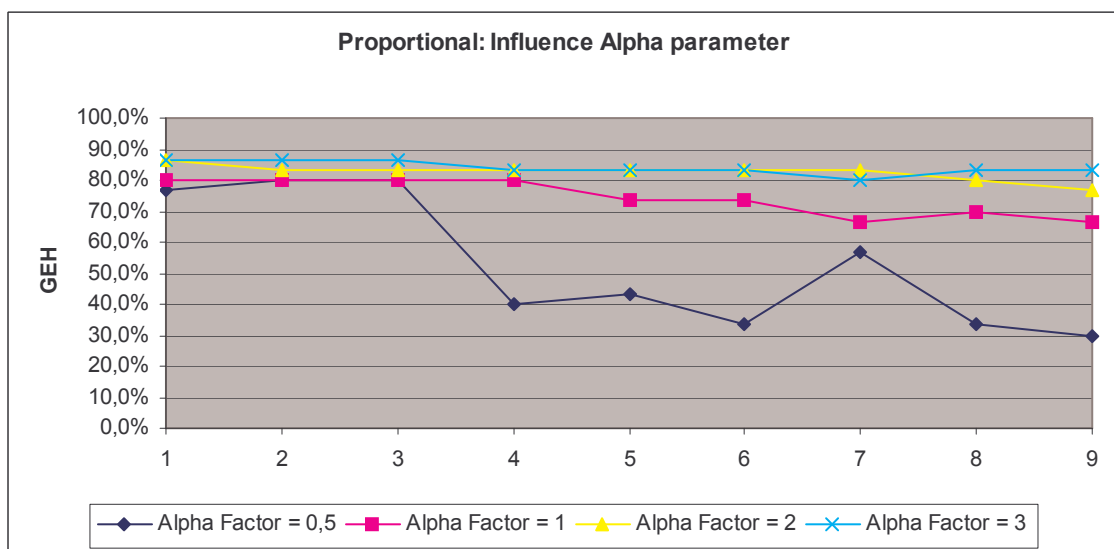


Figure 10.17. Influence of the alpha parameter in the proportional route choice model

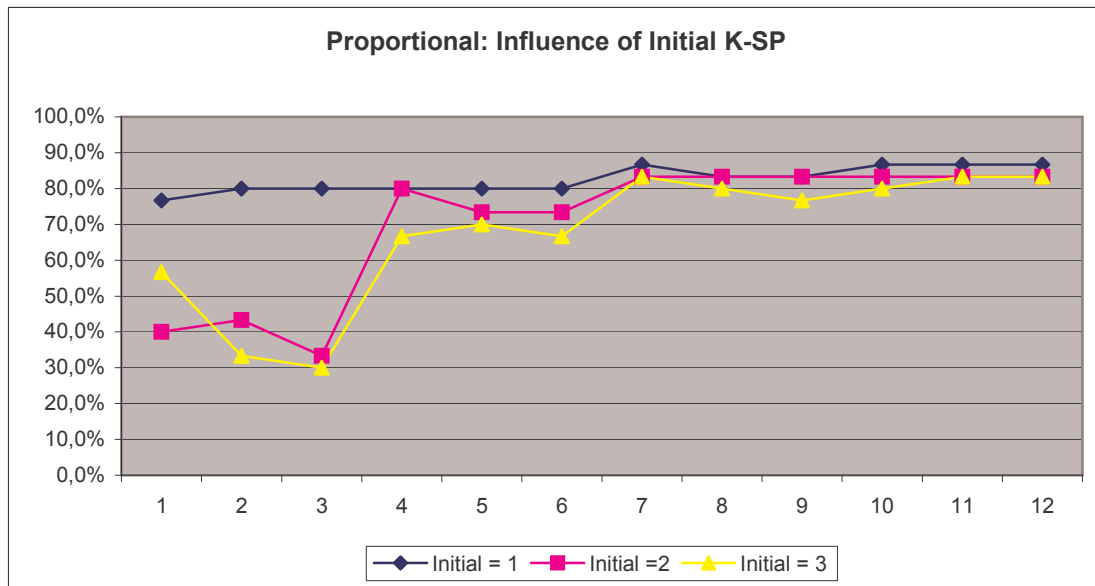


Figure 10.18. Influence of the Initial K-SP parameter in the proportional route choice model

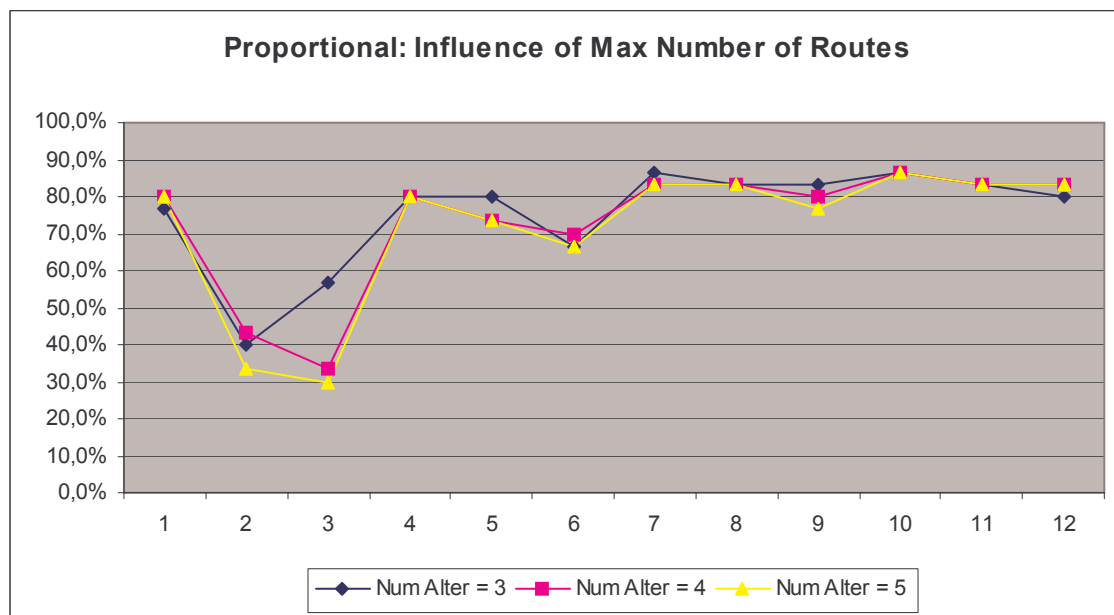


Figure 10.19. Influence of the maximum number of routes in the proportional route choice model

10.2.2.2 LOGIT ROUTE CHOICE

Table 10.6 shows the GEH index and R^2 value of the average replication of all the experiments in which the logit route choice model was used.

Experiment Number	Logit			Global GEH	R^2
	Scale Factor	Initial K-SP	Max Number of Routes		
1	10	1	3	86.7%	93.1%

2	10	1	4	83.3%	93.2%
3	10	1	5	83.3%	92.7%
4	10	2	3	80.0%	93.3%
5	10	2	4	80.0%	93.4%
6	10	2	5	80.0%	93.5%
7	10	3	3	76.7%	92.6%
8	10	3	4	80.0%	92.4%
9	10	3	5	76.7%	93.1%
10	60	1	3	86.7%	93.3%
11	60	1	4	86.7%	93.8%
12	60	1	5	86.7%	93.9%
13	60	2	3	83.3%	94.5%
14	60	2	4	83.3%	94.3%
15	60	2	5	83.3%	94.1%
16	60	3	3	80.0%	93.4%
17	60	3	4	80.0%	93.4%
18	60	3	5	80.0%	93.3%
19	100	1	3	86.7%	92.7%
20	100	1	4	86.7%	92.9%
21	100	1	5	86.7%	92.9%
22	100	2	3	83.3%	93.0%
23	100	2	4	80.0%	93.5%
24	100	2	5	80.0%	94.1%
25	100	3	3	80.0%	93.1%
26	100	3	4	80.0%	92.8%
27	100	3	5	80.0%	93.2%
28	600	1	3	66.7%	89.1%
29	600	1	4	73.3%	89.6%
30	600	1	5	70.0%	89.6%
31	600	2	3	80.0%	92.3%
32	600	2	4	80.0%	91.9%
33	600	2	5	80.0%	91.8%
34	600	3	3	80.0%	92.2%
35	600	3	4	76.7%	91.6%
36	600	3	5	73.3%	91.0%

Table 10.6. Logit route choice model

Figure 10.20 depicts the GEH of all the experiments in which the logit route choice model was used.

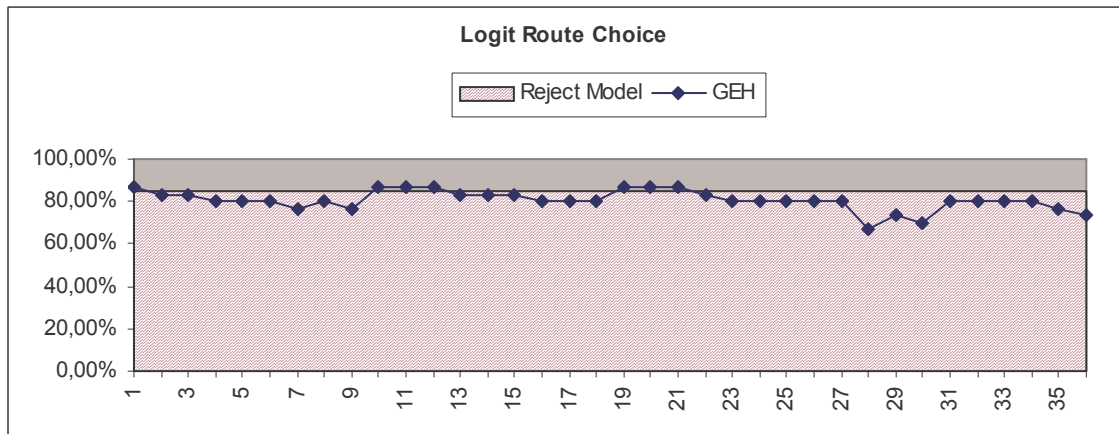


Figure 10.20. Validation of the logit route choice model using GEH criteria

Figure 10.21, Figure 10.22 and Figure 10.23 shows the influence of each route choice parameter when the logit route choice model was used.

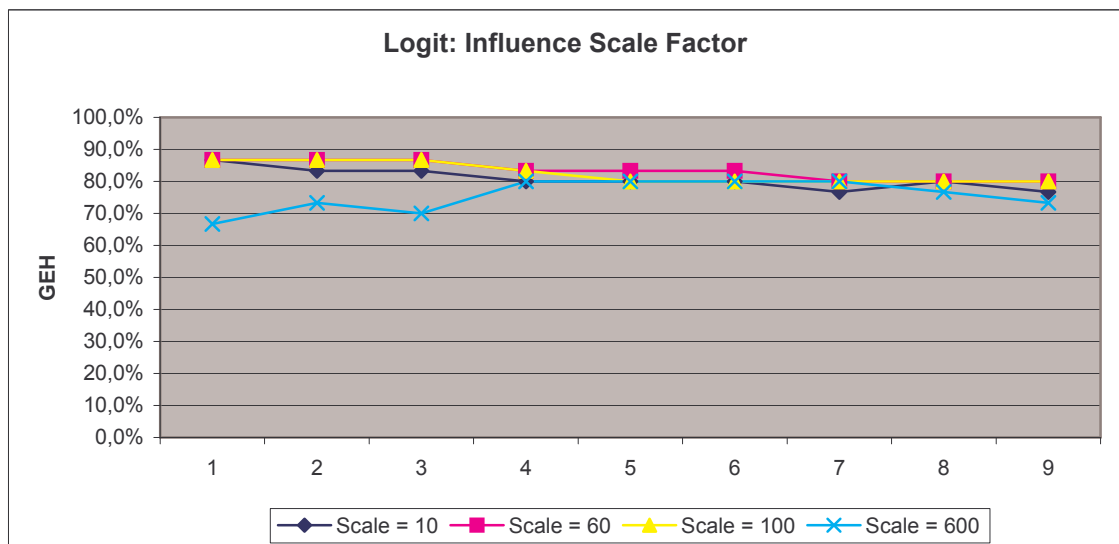


Figure 10.21. Influence of the scale factor parameter in the logit route choice model

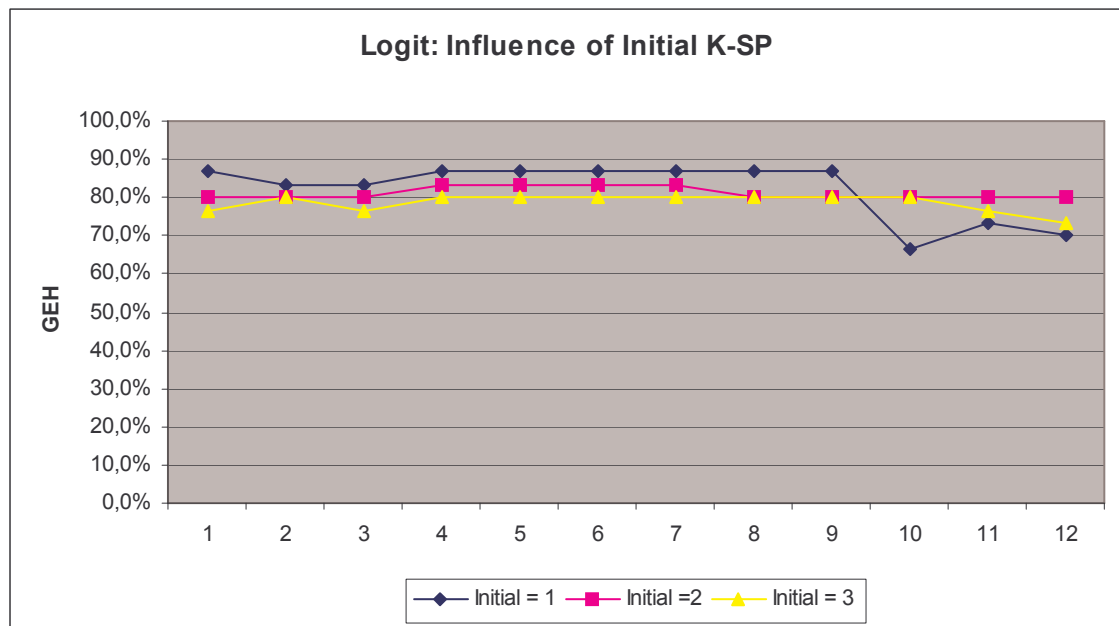


Figure 10.22. Influence of the Initial K-SP parameter in the logit route choice model

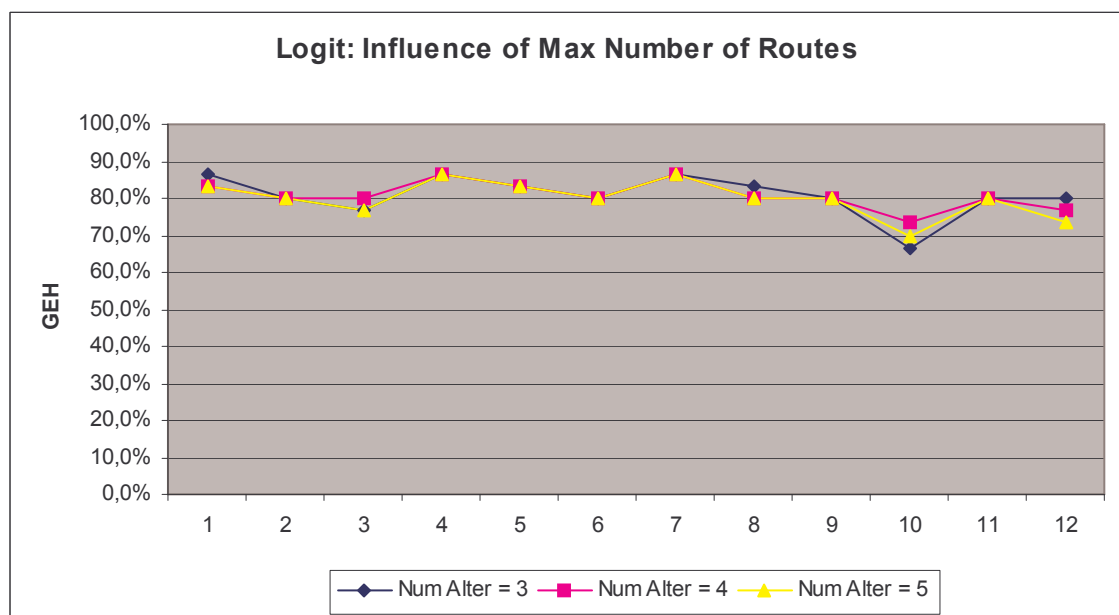


Figure 10.23. Influence of the maximum number of routes parameter in the logit route choice model

10.2.2.3 C-LOGIT ROUTE CHOICE WITH FIXED BETA AND GAMMA

Table 10.7 shows the GEH index and R^2 value of the average replication of all the experiments in which the C-logit route choice model was used and beta and gamma were fixed to 0.15 and 1.0 respectively.

Experiment Number	C-Logit		Max Number of Routes	Global GEH	R ²
	Scale Factor	Initial K-SP			
1	10	1	3	86.7%	93.4%
2	10	1	4	86.7%	93.2%
3	10	1	5	80.0%	92.9%
4	10	2	3	80.0%	93.6%
5	10	2	4	80.0%	93.4%
6	10	2	5	80.0%	93.2%
7	10	3	3	76.7%	93.5%
8	10	3	4	76.7%	92.7%
9	10	3	5	76.7%	92.8%
10	60	1	3	83.3%	92.9%
11	60	1	4	86.7%	93.1%
12	60	1	5	83.3%	92.5%
13	60	2	3	83.3%	93.8%
14	60	2	4	83.3%	93.6%
15	60	2	5	86.7%	93.5%
16	60	3	3	83.3%	93.5%
17	60	3	4	83.3%	93.5%
18	60	3	5	83.3%	92.7%
19	100	1	3	83.3%	91.1%
20	100	1	4	76.7%	91.1%
21	100	1	5	83.3%	91.6%
22	100	2	3	83.3%	93.5%
23	100	2	4	86.7%	93.0%
24	100	2	5	86.7%	92.9%
25	100	3	3	76.7%	91.6%
26	100	3	4	83.3%	93.3%
27	100	3	5	73.3%	92.4%
28	600	1	3	73.3%	88.8%
29	600	1	4	80.0%	91.0%
30	600	1	5	76.7%	89.9%
31	600	2	3	83.3%	92.9%
32	600	2	4	86.7%	92.9%
33	600	2	5	80.0%	92.8%
34	600	3	3	73.3%	91.5%
35	600	3	4	73.3%	91.4%
36	600	3	5	80.0%	92.1%

Table 10.7. C-logit route choice model with fixed beta and gamma

Figure 10.24 depicts the GEH of all experiments in which the C-logit route choice model was used.

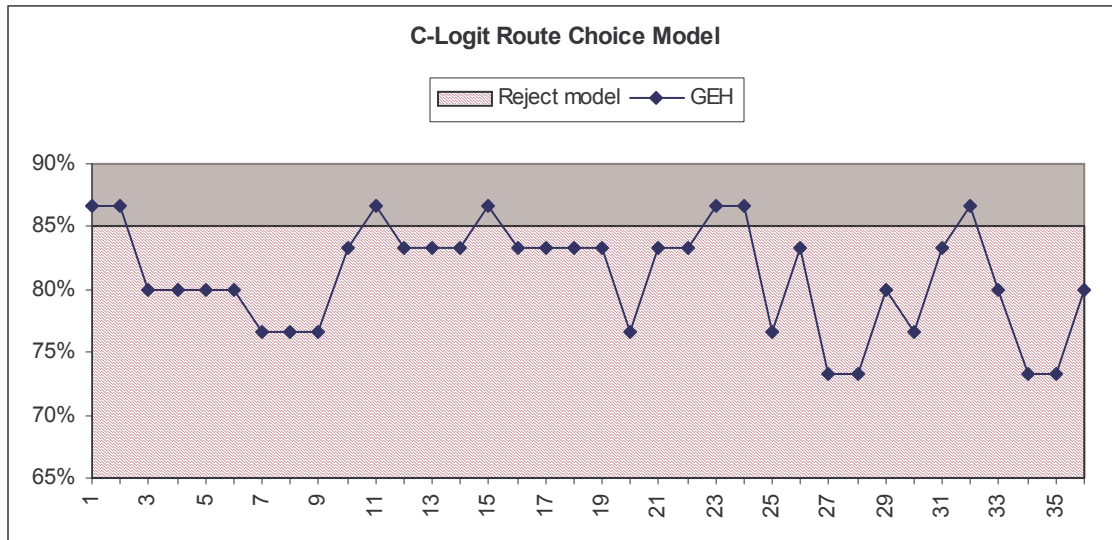


Figure 10.24. Validation of the C-logit route choice model using GEH criteria

Figure 10.25, Figure 10.26 and Figure 10.27 show the influence of each route choice parameter when a C-logit route choice model was used.

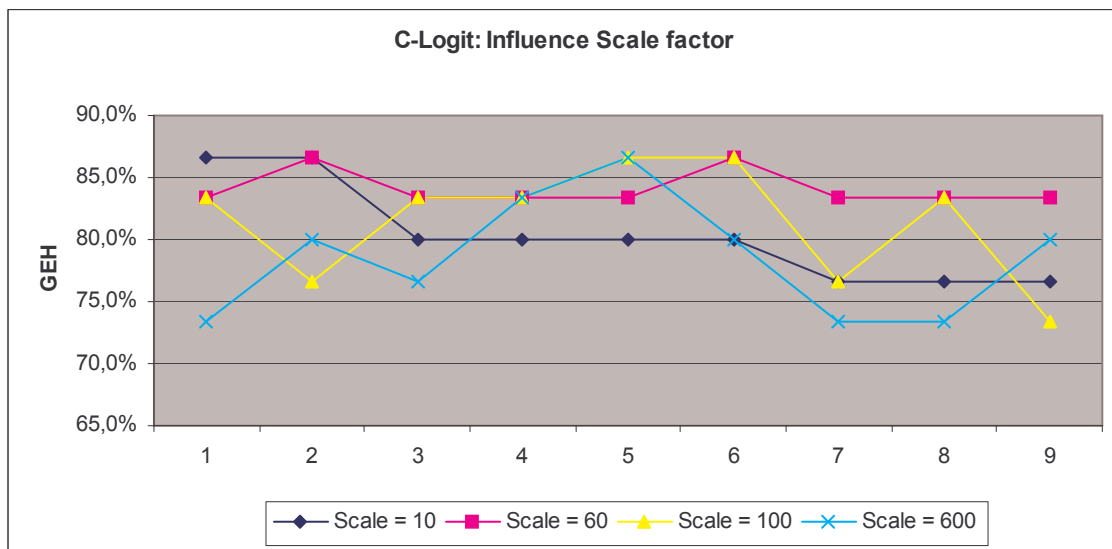


Figure 10.25. Influence of the scale factor parameter in the C-logit route choice model

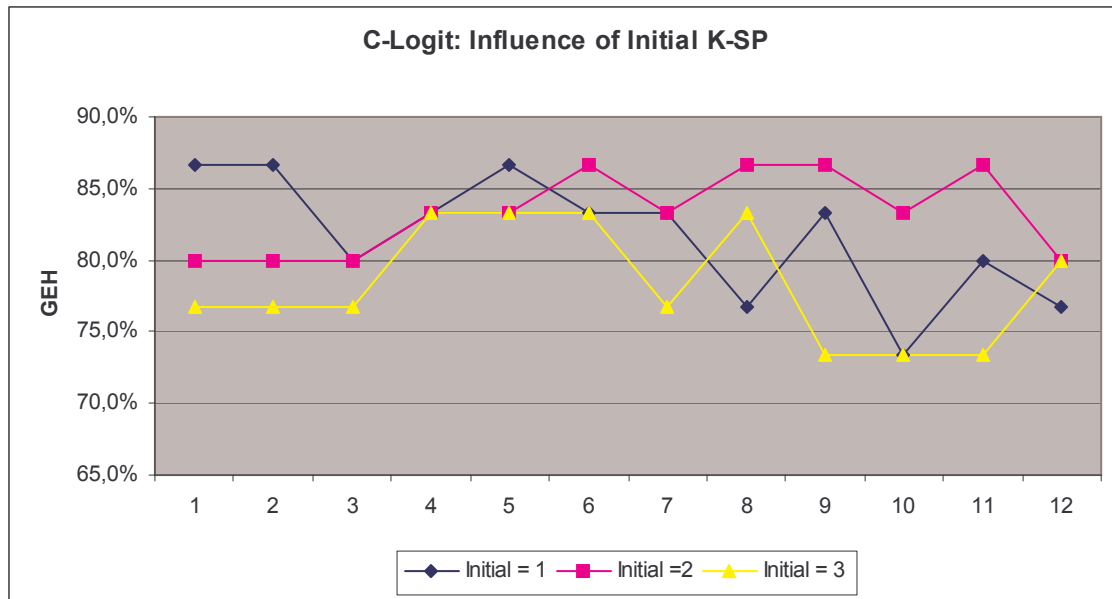


Figure 10.26. Influence of the Initial K-SP parameter in the logit route choice model

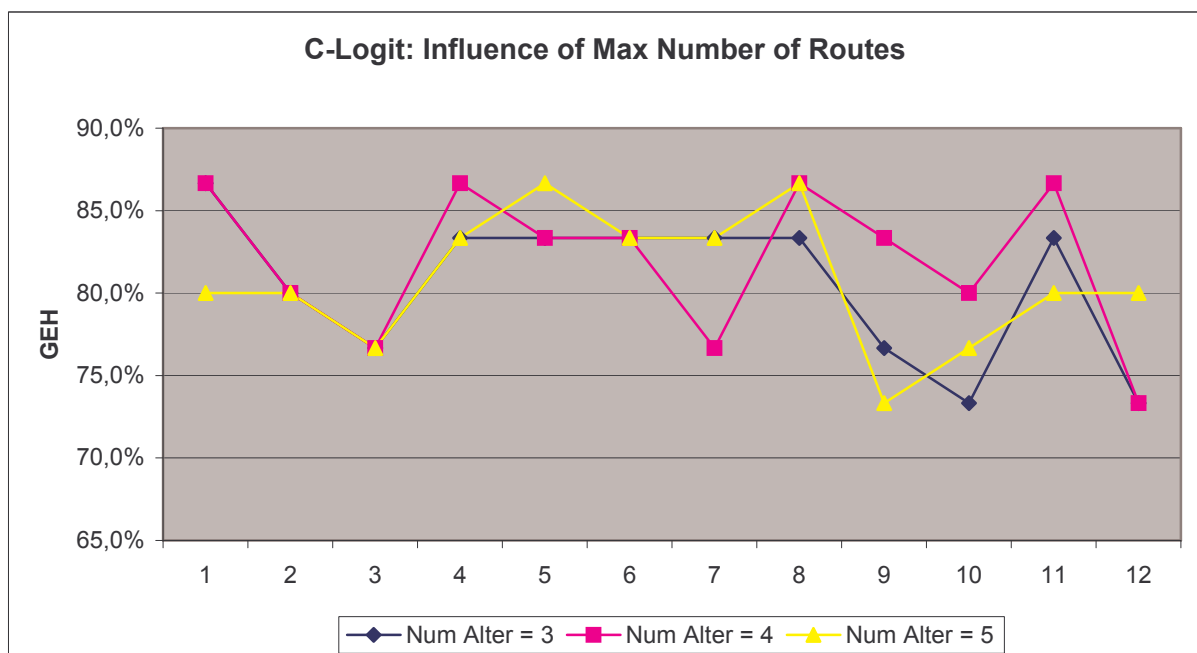


Figure 10.27. Influence of the maximum number of routes parameter in the logit route choice model

10.2.2.4 C-LOGIT ROUTE CHOICE WITH VARYING BETA AND GAMMA

Table 10.8 shows the GEH index and R^2 value of all the experiments in which the C-logit route choice model was used, the values of beta and gamma varied, the scale factor was fixed to 60, *Initial K-SP* was fixed to 2 and the *Max number of Routes* was fixed to 3.

C-Logit			
Beta	Gamma	Global GEH	R ²
0.10	0.5	80.0%	93.5%
0.10	1.0	83.3%	93.7%
0.10	1.5	86.7%	93.1%
0.10	2.0	83.3%	93.1%
0.15	0.5	86.7%	93.5%
0.15	1.0	83.3%	93.5%
0.15	1.5	86.7%	93.9%
0.15	2.0	83.3%	93.2%
0.50	0.5	86.7%	94.1%
0.50	1.0	86.7%	93.5%
0.50	1.5	86.7%	93.7%
0.50	2.0	86.7%	93.5%
1.00	0.5	86.7%	93.7%
1.00	1.0	86.7%	93.6%
1.00	1.5	86.7%	93.1%
1.00	2.0	86.7%	93.6%

Table 10.8. C-logit route choice model with varying beta and gamma

Figure 10.28 depicts the GEH of all the experiments in which the C-logit route choice model was used and the beta and gamma parameters varied.

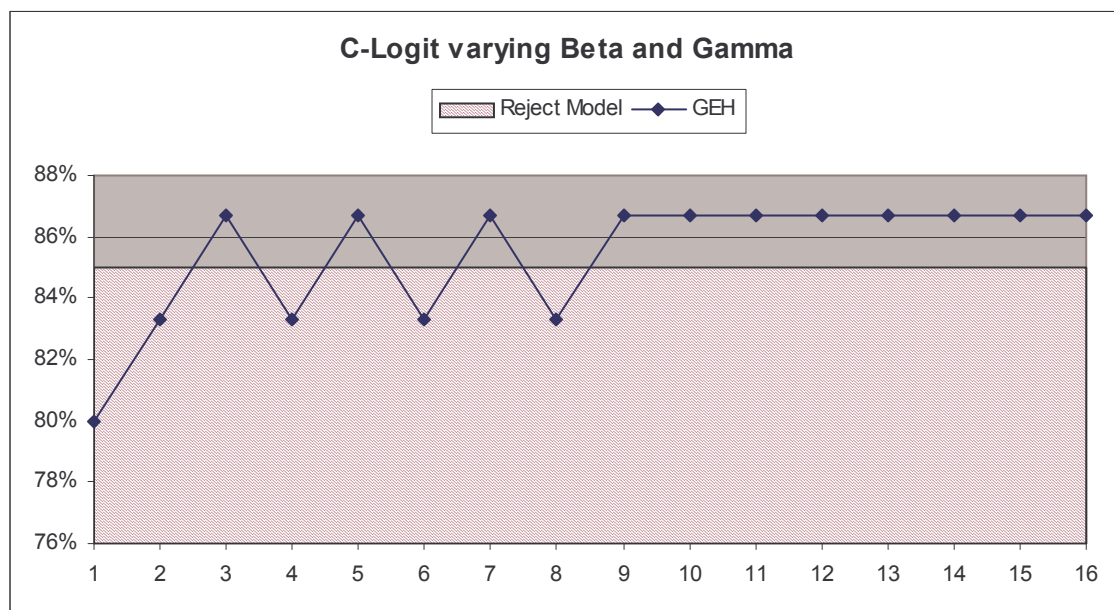


Figure 10.28. Validation of the C-logit route choice model in which beta and gamma vary, using GEH criteria

Figure 10.29 and Figure 10.30 show the influence of each route choice parameter when a C-logit route choice model was used.

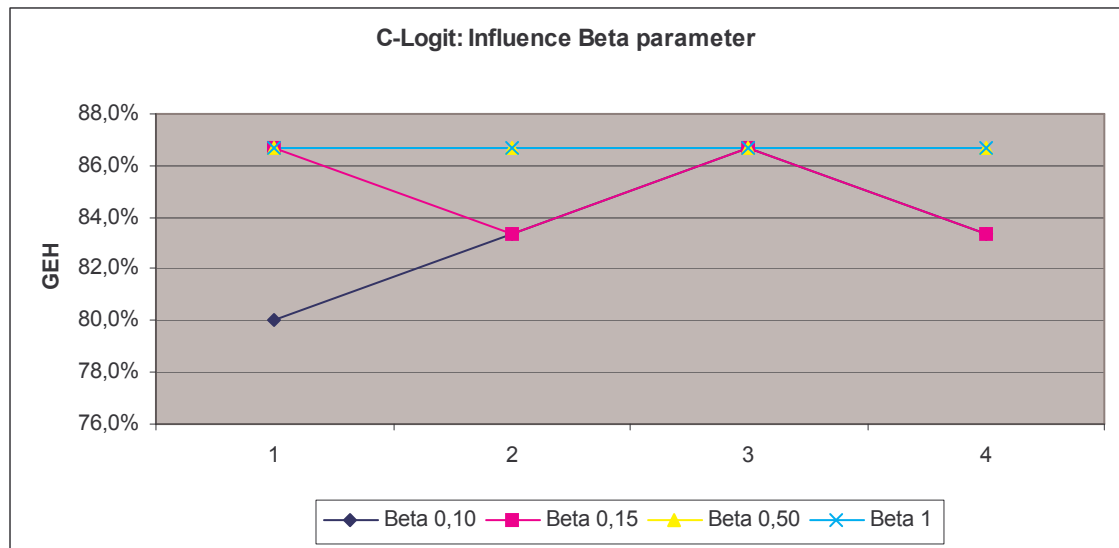


Figure 10.29. Influence of beta in the C-logit route choice model

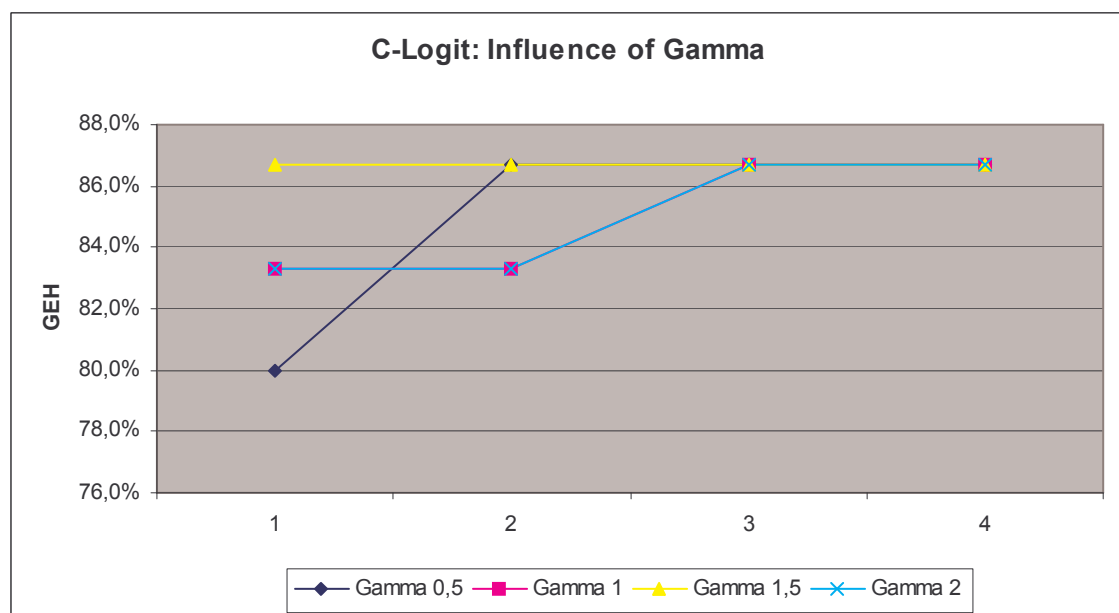


Figure 10.30. Influence of gamma in the C-logit route choice model

10.3 BRUNNSVIKEN MODEL

10.3.1 EXPERIMENT DESCRIPTION

This section presents the validation results of dynamic traffic assignment parameters based on a standard comparison between model and system outputs for a medium-sized urban network that models a part of the city of Stockholm in Sweden.

The set of real traffic data comprises traffic counts gathered at 23 detector stations from 3 May 2001 to 4 May 2001. The level of aggregation was 30 minutes over 24 hours. From the data, we considered only the morning peak time (from 07:00 to 08:30) and calculated the average traffic count for each detector. Depending on the route choice model employed (proportional, logit or C-logit), the experimental design factors for the simulations were as follows:

- Proportional route choice model:
 - Alpha factor, for which values of 1, 2, 2.5 and 3 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 3, 4 and 5 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The following random seeds were changed: 9182, 1670, 6534, 8159, 8538, 5768, 1277, 1065, 1846, 8740, 1489, 3334, 6232, 6237 and 1870.

- Logit route choice model:
 - Scale factor, for which values of 1, 10, 60 and 100 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 2, 3 and 4 were considered

If these three factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

- Logit route choice model:

-
- C-logit route choice model with fixed beta and gamma:
 - Scale factor, for which values of 1, 10, 60 and 100 were considered
 - *Initial K-SP*, for which values of 1, 2 and 3 were considered
 - Maximum number of routes, for which values of 3, 4 and 5 were considered
 - Beta fixed to 0.15
 - Gamma fixed to 1
 - If these factors are combined, the total number of experiments is 36 ($4 * 3 * 3$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.
 - C-logit route choice model with varying beta and gamma:
 - Scale factor fixed to 10
 - *Initial K-SP* fixed to 1.
 - Maximum number of routes fixed to 3
 - Beta, for which values of 0.10, 0.15, 0.50 and 1 were considered
 - Gamma, for which values of 0.5, 1, 1.5 and 2 were considered

If these factors are combined, the total number of experiments is 16 ($4 * 4$), each of which was simulated 15 times (replications). The random seeds were changed as in the proportional route choice model.

○

10.3.2 EXPERIMENT RESULTS

In the following sections, we analyse the experiments, which have been grouped by route choice function.

10.3.2.1 PROPORTIONAL ROUTE CHOICE

The following table shows the GEH index and R^2 of all the experiments in which the proportional route choice function was used.

Experiment Number	Proportional			Global GEH	R ²
	Alpha Factor	Initial K-SP	Max Number of Routes		
1	1	1	3	77.3%	91.0%
2	1	1	4	77.3%	91.3%
3	1	1	5	77.3%	91.2%
4	1	2	3	16.6%	40.9%
5	1	2	4	16.6%	37.5%
6	1	2	5	16.7%	37.8%
7	1	3	3	31.9%	47.1%
8	1	3	4	28.9%	43.9%
9	1	3	5	22.7%	41.6%
10	2	1	3	77.3%	93.1%
11	2	1	4	77.3%	92.8%
12	2	1	5	77.3%	92.8%
13	2	2	3	69.8%	88.2%
14	2	2	4	68.2%	90.5%
15	2	2	5	65.2%	89.4%
16	2	3	3	72.7%	89.5%
17	2	3	4	75.8%	89.7%
18	2	3	5	69.8%	89.6%
19	2.5	1	3	75.8%	92.2%
20	2.5	1	4	75.8%	92.2%
21	2.5	1	5	77.3%	92.2%
22	2.5	2	3	72.8%	90.5%
23	2.5	2	4	74.3%	90.4%
24	2.5	2	5	74.3%	91.0%
25	2.5	3	3	86.4%	92.5%
26	2.5	3	4	77.3%	90.7%
27	2.5	3	5	78.8%	91.8%
28	3	1	3	77.3%	92.7%
29	3	1	4	78.8%	92.8%
30	3	1	5	78.8%	92.7%
31	3	2	3	89.4%	93.5%
32	3	2	4	81.9%	91.2%
33	3	2	5	81.9%	90.6%
34	3	3	3	84.9%	92.4%
35	3	3	4	86.4%	93.2%
36	3	3	5	83.4%	92.4%

Table 10.9. Proportional route choice model

Figure 10.31 depicts the GEH of all the experiments in which the proportional route choice model was used.

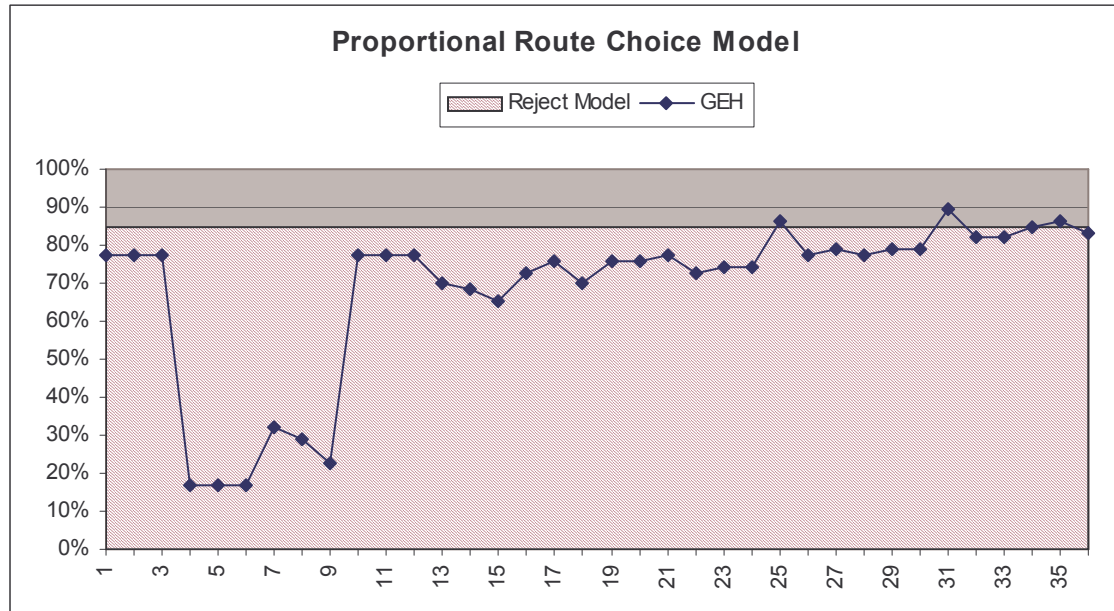


Figure 10.31. Validation of the proportional route choice model using GEH criteria

Figure 10.32, Figure 10.33 and Figure 10.34 show the influence of each route choice parameter when a proportional route choice model was used.

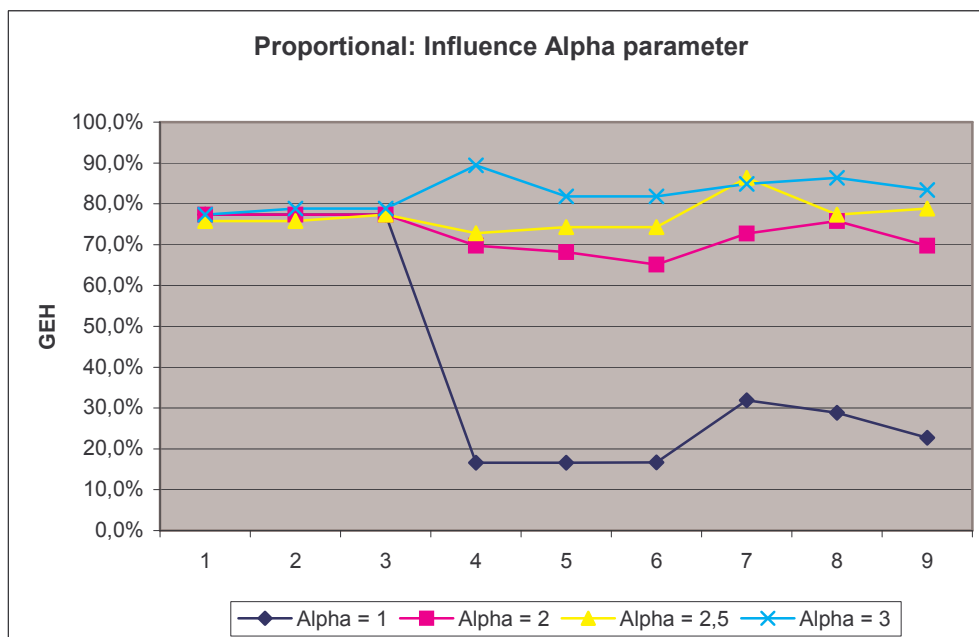


Figure 10.32. Influence of the alpha parameter in the proportional route choice model

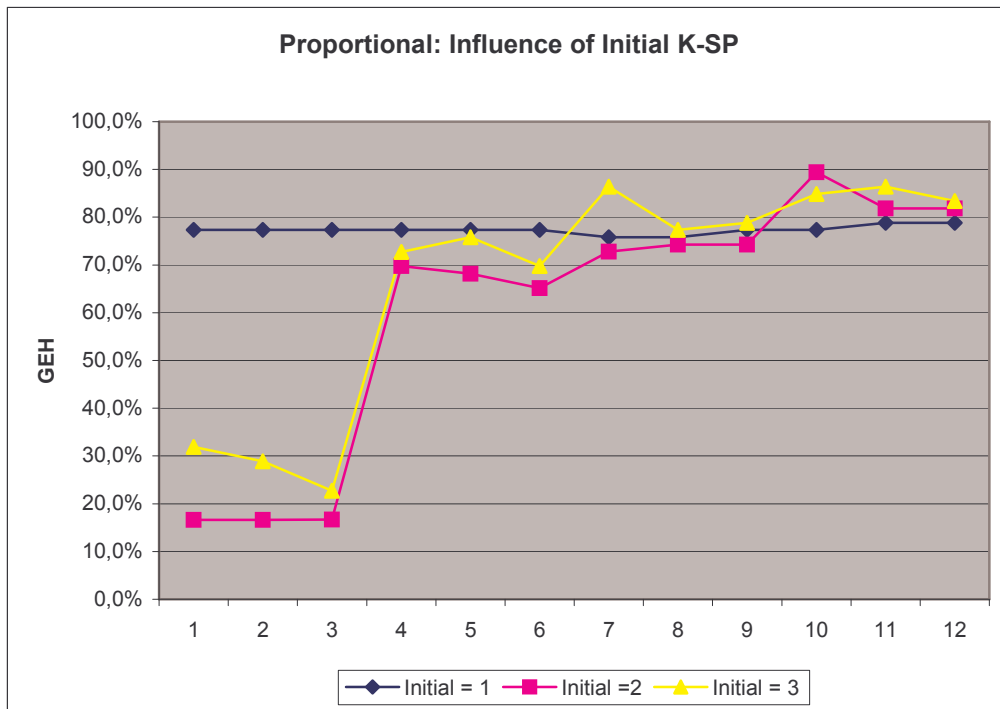


Figure 10.33. Influence of the Initial K-SP parameter in the proportional route choice model

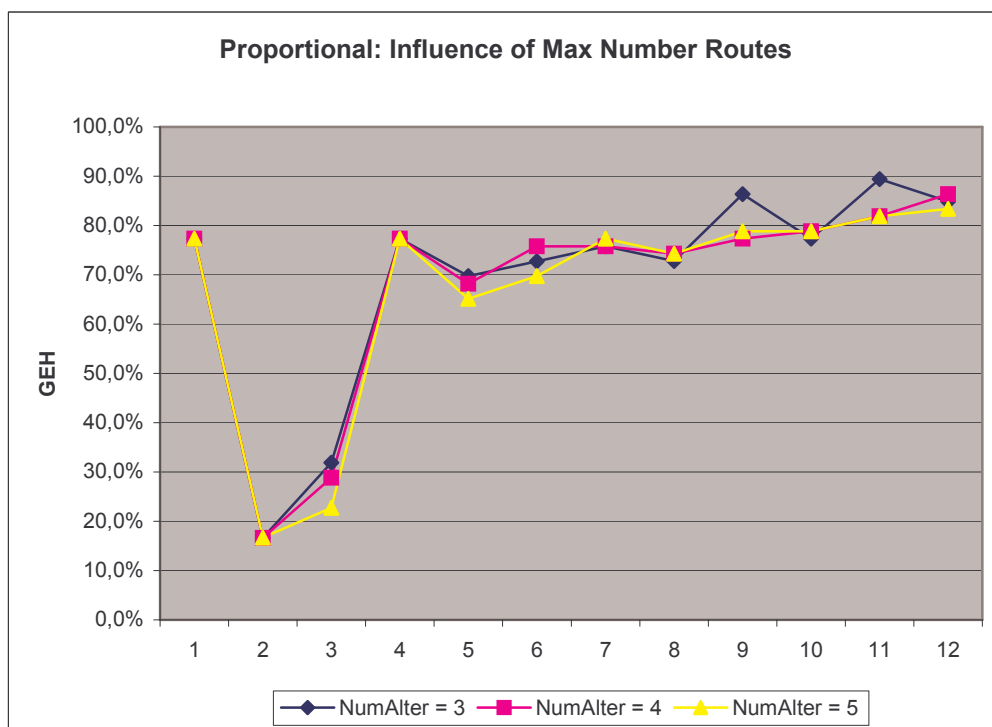


Figure 10.34. Influence of the Max Number of Routes parameter in the proportional route choice model

10.3.2.2 LOGIT ROUTE CHOICE

Table 10.10 shows the GEH index and R^2 of all experiments in which the logit route choice function was used.

Experiment Number	Logit		Max Number of Routes	Global GEH	R^2
	Scale Factor	Initial K-SP			
1	1	1	3	75%	91%
2	1	1	4	78%	91%
3	1	1	5	78%	91%
4	1	2	3	12%	31%
5	1	2	4	12%	27%
6	1	2	5	13%	28%
7	1	3	3	20%	32%
8	1	3	4	20%	29%
9	1	3	5	13%	32%
10	10	1	3	81%	93%
11	10	1	4	81%	93%
12	10	1	5	81%	93%
13	10	2	3	88%	94%
14	10	2	4	86%	93%
15	10	2	5	88%	94%
16	10	3	3	87%	93%
17	10	3	4	88%	94%
18	10	3	5	88%	94%
19	60	1	3	67%	90%
20	60	1	4	67%	90%
21	60	1	5	67%	90%
22	60	2	3	70%	93%
23	60	2	4	71%	93%
24	60	2	5	71%	93%
25	60	3	3	70%	92%
26	60	3	4	70%	91%
27	60	3	5	70%	91%
28	100	1	3	65%	89%
29	100	1	4	65%	89%
30	100	1	5	65%	89%
31	100	2	3	68%	91%
32	100	2	4	68%	91%

33	100	2	5	68%	91%
34	100	3	3	70%	92%
35	100	3	4	70%	92%
36	100	3	5	70%	92%

Table 10.10. Logit route choice model

Figure 10.35 depicts the GEH of all the experiments in which a proportional route choice model was used.

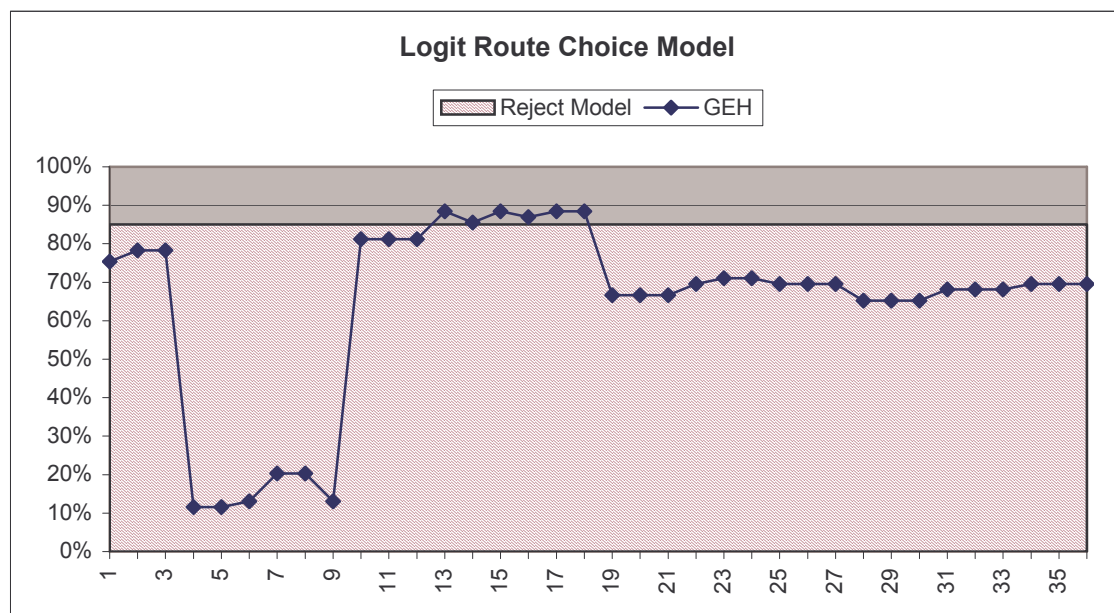


Figure 10.35. Validation of the logit route choice model using GEH criteria

Figure 10.36, Figure 10.37 and Figure 10.38 show the influence of each route choice parameter when a logit route choice model was used.

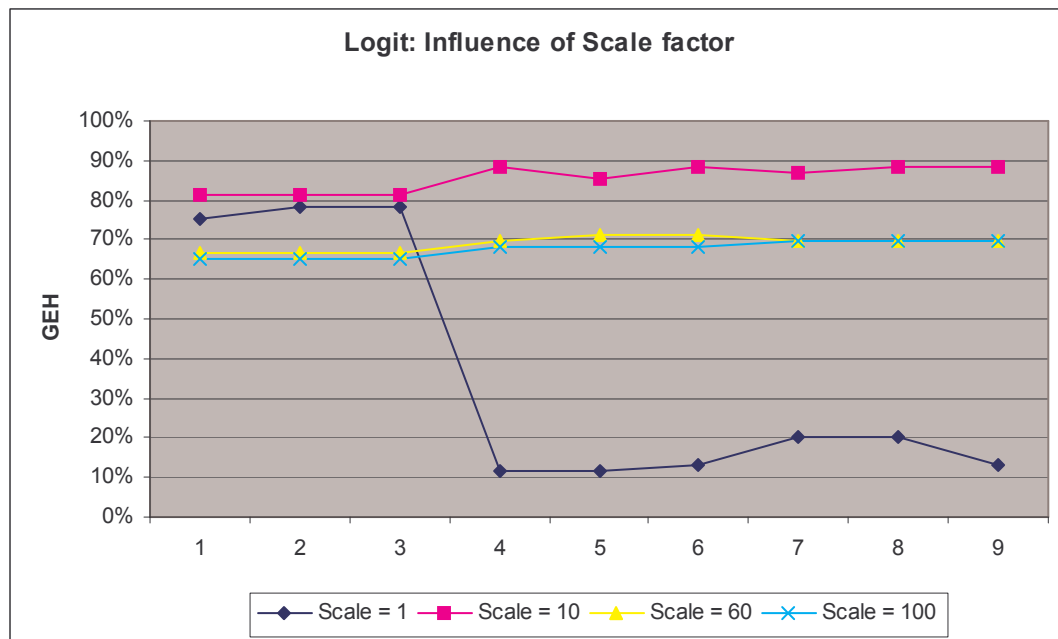


Figure 10.36. Influence of the scale factor parameter in the logit route choice model

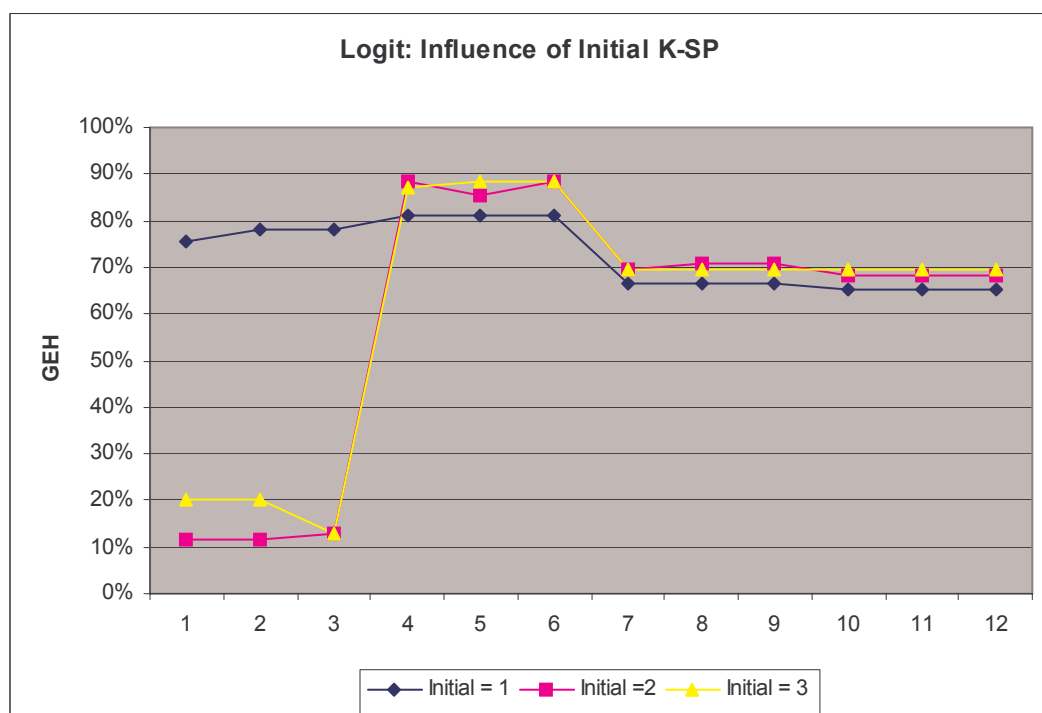


Figure 10.37. Influence of the Initial K-SP parameter in the logit route choice model

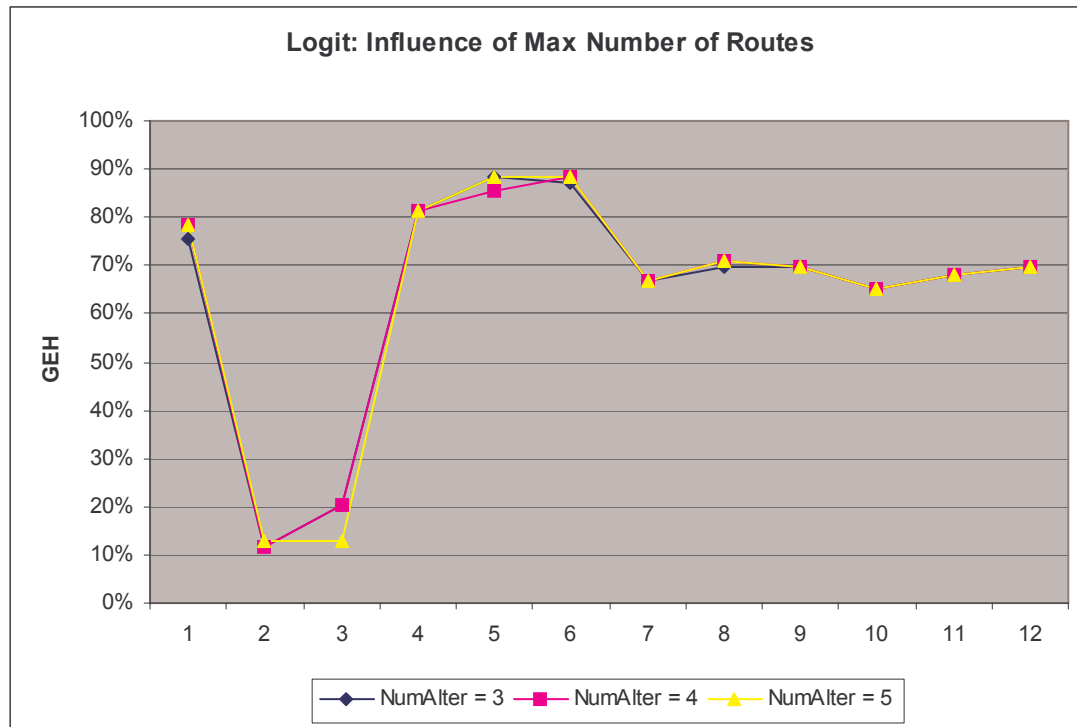


Figure 10.38. Influence of the maximum number of routes parameter in the logit route choice model

10.3.2.3 C-LOGIT ROUTE CHOICE WITH FIXED BETA AND GAMMA

Table 10.11 shows the GEH index and R^2 of all the experiments in which the C-logit route choice function was used.

Experiment Number	C-Logit		Max Number of Routes	Global GEH	R^2
	Scale Factor	Initial K-SP			
1	1	1	3	76%	91%
2	1	1	4	76%	91%
3	1	1	5	77%	91%
4	1	2	3	12%	34%
5	1	2	4	15%	27%
6	1	2	5	11%	29%
7	1	3	3	23%	34%
8	1	3	4	17%	30%
9	1	3	5	15%	32%
10	10	1	3	77%	92%
11	10	1	4	77%	92%

12	10	1	5	77%	92%
13	10	2	3	80%	93%
14	10	2	4	79%	93%
15	10	2	5	80%	93%
16	10	3	3	83%	94%
17	10	3	4	82%	93%
18	10	3	5	83%	93%
19	60	1	3	65%	90%
20	60	1	4	64%	90%
21	60	1	5	68%	90%
22	60	2	3	70%	92%
23	60	2	4	68%	92%
24	60	2	5	71%	91%
25	60	3	3	68%	92%
26	60	3	4	67%	92%
27	60	3	5	70%	92%
28	100	1	3	64%	90%
29	100	1	4	62%	89%
30	100	1	5	62%	89%
31	100	2	3	71%	92%
32	100	2	4	64%	90%
33	100	2	5	70%	91%
34	100	3	3	64%	91%
35	100	3	4	71%	91%
36	100	3	5	70%	91%

Table 10.11. C-logit route choice model

Figure 10.39 depicts the GEH of all the experiments in which the C-logit route choice model was used.

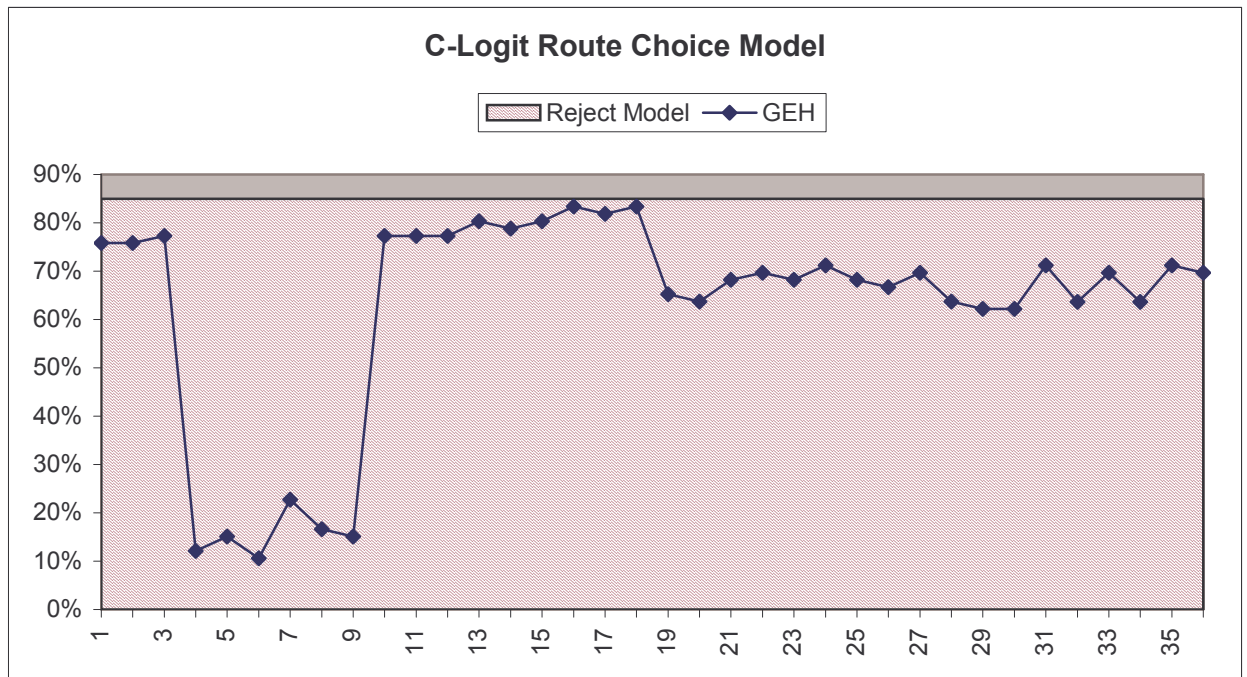


Figure 10.39. Validation of the C-logit route choice model using GEH criteria

Figure 10.40, Figure 10.41 and Figure 10.42 show the influence of each route choice parameter when a C-logit route choice model was used.

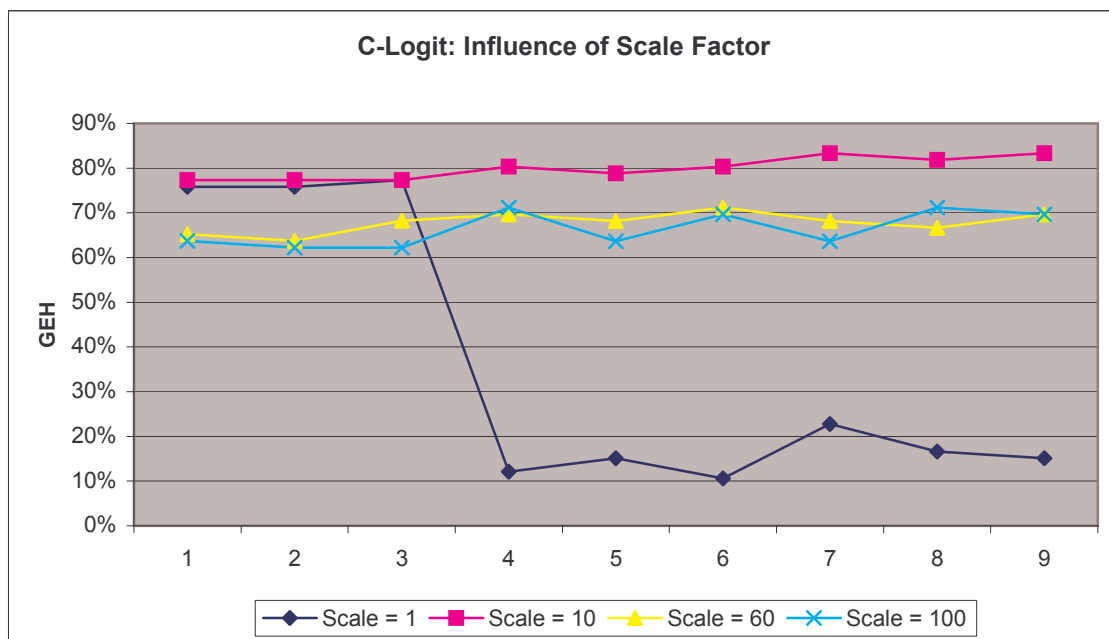


Figure 10.40. Influence of the scale factor parameter in the C-logit route choice model

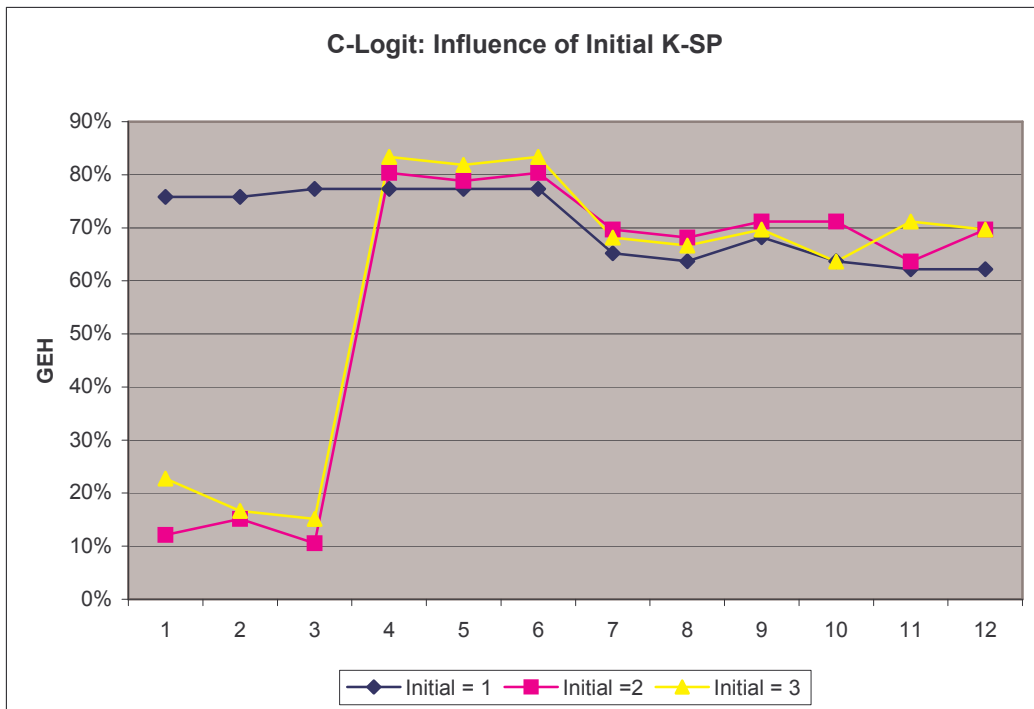


Figure 10.41. Influence of the Initial K-SP parameter in the logit route choice model

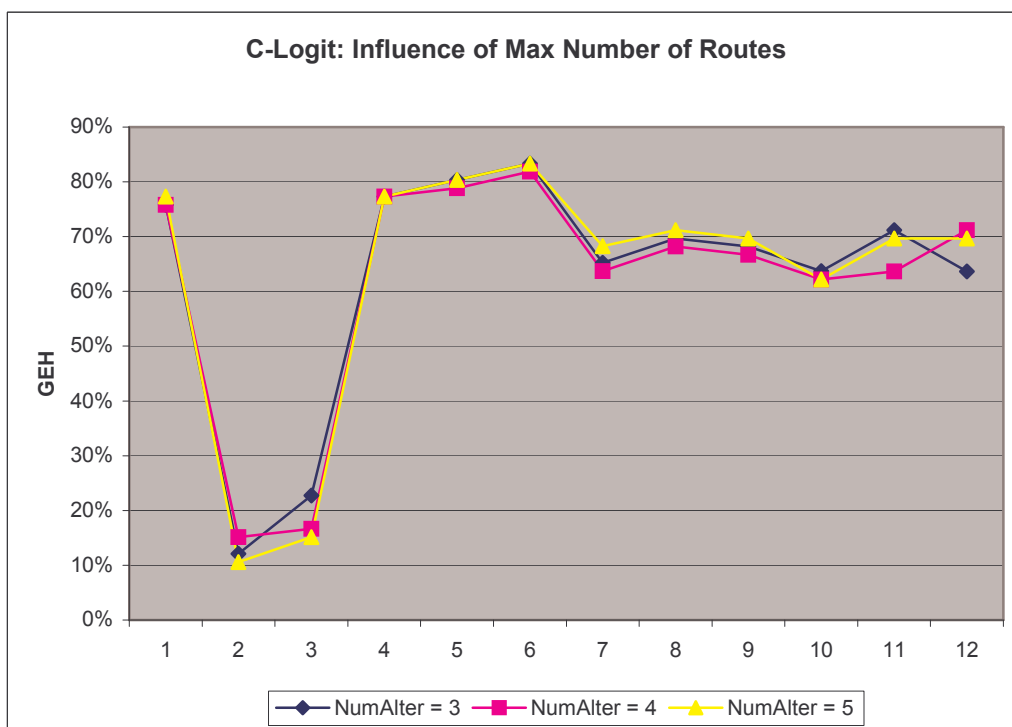


Figure 10.42. Influence of the maximum number of routes parameter in the logit route choice model

10.3.2.4 C-LOGIT ROUTE CHOICE WITH VARYING BETA AND GAMMA

Table 10.12 shows the GEH index and R^2 value of all the experiments in which the C-logit route choice model was used, the values of beta and gamma varied, the scale factor was fixed to 10, *Initial K-SP* was fixed to 1 and the *Max number of Routes* was fixed to 3.

Experiment Number	C-Logit		Global GEH	R^2
	Beta	Gamma		
1	0.10	0.5	77.32%	92.60%
2	0.10	1.0	77.32%	92.33%
3	0.10	1.5	75.80%	91.77%
4	0.10	2.0	77.32%	92.02%
5	0.15	0.5	77.32%	91.90%
6	0.15	1.0	77.32%	92.25%
7	0.15	1.5	77.32%	92.11%
8	0.15	2.0	78.83%	92.51%
9	0.50	0.5	78.83%	92.08%
10	0.50	1.0	77.32%	92.00%
11	0.50	1.5	78.83%	92.49%
12	0.50	2.0	78.83%	91.97%
13	1.00	0.5	77.32%	92.00%
14	1.00	1.0	78.83%	92.08%
15	1.00	1.5	78.76%	91.23%
16	1.00	2.0	80.28%	92.41%

Table 10.12. C-logit route choice model with varying beta and gamma

Figure 10.43 depicts the GEH of all the experiments in which the C-logit route choice model and beta and gamma varied.

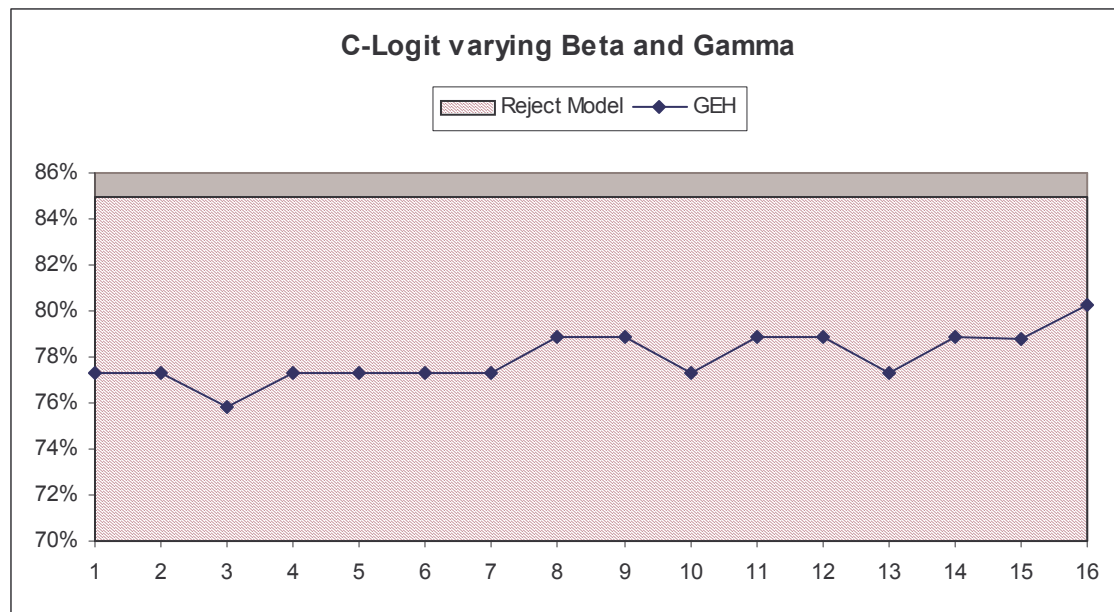


Figure 10.43. Validation of the C-logit route choice model in which beta and gamma varied, using GEH criteria

Figure 10.44 and Figure 10.45 show the influence of each route choice parameter when the C-logit route choice model was used.

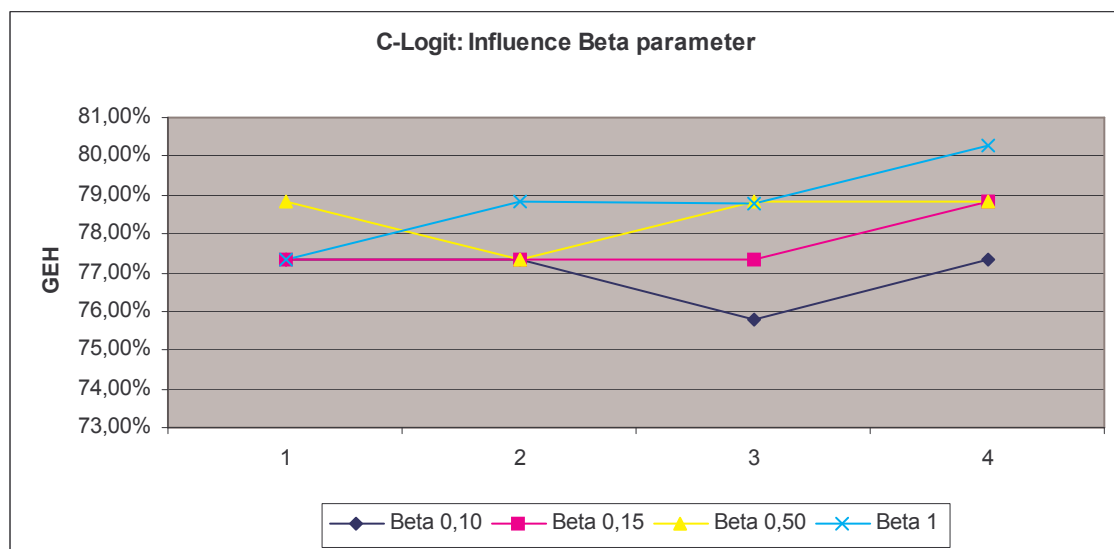


Figure 10.44. Influence of beta in the C-logit route choice model

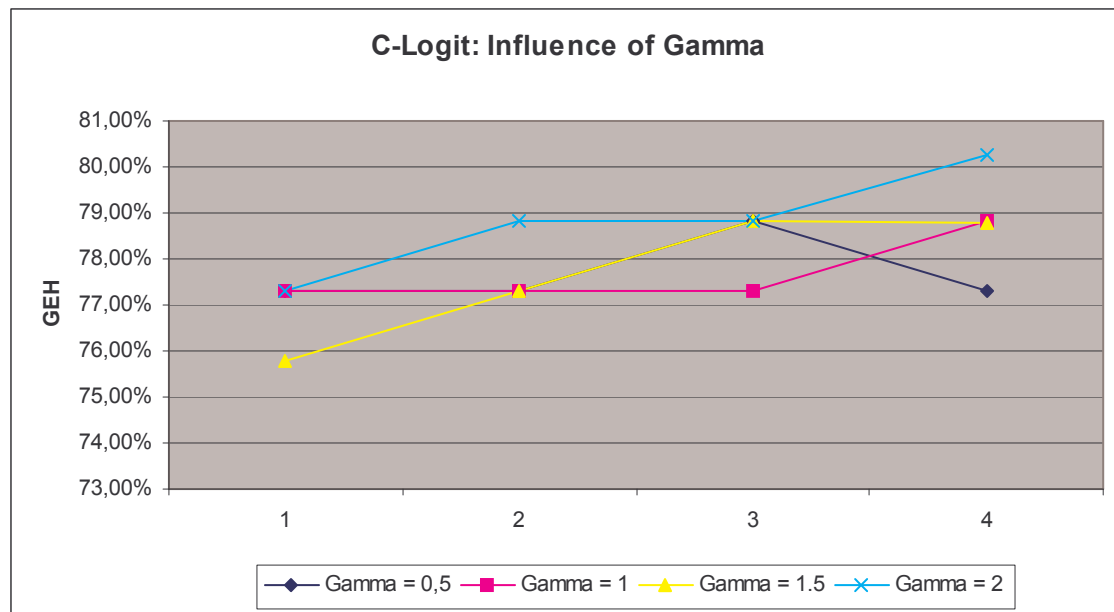


Figure 10.45. Influence of gamma in the C-logit route choice model