Exercise 1 Basic Statistics

Q1:

Number of students: 340823

Number of schools: 898

Number of programs: 32

Q2:

Number of choices: 2773

Q3:

Number of students applying to at least one senior high schools in the same district to home: 265464

Q4:

Number of students each senior high school admitted:

	schooladmit	count
1	10101	398
2	10102	248
3	10103	443
4	10104	220
5	10105	346
6	10106	395
7	10107	306
8	10108	318
9	10109	300
10	10110	535
11	10111	600
12	10112	300
13	10114	350
14	10115	238

Q5:

The cutoff of senior high schools:

	schooladmit	lowest
1	10101	284
2	10102	343
3	10103	316
4	10104	245
5	10105	260
6	10106	293
7	10107	281
8	10108	248
9	10109	257
10	10110	343
11	10111	371
12	10112	316
13	10114	319
14	10115	274

Q6:

The quality of senior high schools:

	schooladmit	average
1	10101	320.2312
2	10102	394.1492
3	10103	353.8330
4	10104	296.9182
5	10105	351.2139
6	10106	340.1013
7	10107	311.9542
8	10108	303.9025
9	10109	281.8233
10	10110	408.0785
11	10111	412.5100
12	10112	375.6133
13	10114	346.2229
14	10115	316.3361

Exercise 2 Data

Q1:

School level dataset:

	school	program	choice	sssdistrict	ssslong	ssslat	lowest	average	count
1	10101	Home Economics	10101,Home Economics	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
2	10101	General Arts	10101,General Arts	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
3	10101	Business	10101,Business	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
4	10101	Visual Arts	10101,Visual Arts	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
5	10101	Agriculture	10101,Agriculture	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
6	10101	General Science	10101,General Science	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
7	10101	Technical	10101,Technical	Accra Metropolitan	-0.1971153	5.607396	284	320.2312	398
8	10102	General Arts	10102,General Arts	Accra Metropolitan	-0.1971153	5.607396	343	394.1492	248
9	10102	Home Economics	10102,Home Economics	Accra Metropolitan	-0.1971153	5.607396	343	394.1492	248
10	10102	General Science	10102,General Science	Accra Metropolitan	-0.1971153	5.607396	343	394.1492	248
11	10102	Visual Arts	10102,Visual Arts	Accra Metropolitan	-0.1971153	5.607396	343	394.1492	248
12	10103	General Arts	10103,General Arts	Accra Metropolitan	-0.1971153	5.607396	316	353.8330	443
13	10103	Business	10103,Business	Accra Metropolitan	-0.1971153	5.607396	316	353.8330	443
14	10103	Visual Arts	10103,Visual Arts	Accra Metropolitan	-0.1971153	5.607396	316	353.8330	443

Exercise 3 Distance

Q1:

Distance dataset:

```
  v1              choice        program school                 sssdistrict   ssslong   ssslat
1 1 50112,Home Economics Home Economics   50112                Kumasi Metro -1.597187 6.682060
2 1   50107,General Arts   General Arts   50107                Kumasi Metro -1.597187 6.682060
3 1    50202,Visual Arts    Visual Arts   50202 Atwima / Nwabiagya (Nkawie) -1.808757 6.681337
4 1    50202,Visual Arts    Visual Arts   50202 Atwima / Nwabiagya (Nkawie) -1.808757 6.681337
5 1 50702,Home Economics Home Economics   50702       Kwabre (Mamponteng) -1.541420 6.806778
6 1   50901,General Arts   General Arts   50901   Ejura/Sekyedumase (Ejura) -1.367965 7.462874
                        jssdistrict    jsslong    jsslat  distance
1 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323  8.813579
2 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323  8.813579
3 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323 18.895053
4 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323 18.895053
5 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323 17.179653
6 Bosomtwe/Atwima/Kwanwoma (Kuntanase) -1.562752 6.559323 63.917746
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Exercise 4 Dimensionality Reduction

Q1 – Q4:

scode_rev, pgm_rev, choice_rev, cutoff (lowest), quality (average):

	scode_rev	pgm_rev	choice_rev	lowest	average
1	304	arts	304,arts	207	295.1519
2	304	others	304,others	219	319.2679
3	304	economics	304,economics	192	297.5250
4	210	Science	210,Science	206	333.4961
5	210	arts	210,arts	208	291.3643
6	210	economics	210,economics	203	294.2891
7	902	others	902,others	201	271.1339
8	705	economics	705,economics	198	280.9897
9	705	arts	705,arts	190	279.0592
10	213	economics	213,economics	201	304.7801
11	213	arts	213,arts	206	306.3891
12	213	others	213,others	209	278.2247
13	213	Science	213,Science	231	349.3684
14	203	Science	203,Science	313	381.9022
15	203	arts	203,arts	238	336.7194
16	203	economics	203,economics	253	339.7861
17	701	arts	701,arts	202	297.1085
18	701	economics	701,economics	207	302.6667

Q5 - Q6:

20445 entries in total

	V1	score	rankplace	schoolcode	choicepgm	scode_rev	choice_rev	lowest	average
1	335624	469	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369
2	318458	468	1	schoolcode1	choicepgm1	210	210,Science	206	333.4961
3	318492	467	1	schoolcode1	choicepgm1	210	210,Science	206	333.4961
4	335584	467	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369
5	318422	466	1	schoolcode1	choicepgm1	210	210,Science	206	333.4961
6	318525	466	1	schoolcode1	choicepgm1	210	210,Science	206	333.4961
7	335568	465	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369
8	335629	465	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369
9	335722	465	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369
10	239799	464	1	schoolcode1	choicepgm1	301	301,Science	321	410.9369

Exercise 5 First Model

Q1:

Propose a model specification. Write the Likelihood function.

See function named "likelihood"

Q2:

Estimate parameters and compute the marginal effect of the proposed model

Parameters:

	301,Science	210,Science	501,Science	101,Science	301,arts	301,economics	203,Science	101,arts	301,others	100,Science	701,Science	501,economics
Intercept	0	0.7556229	0.3695213	0.3366644	0.9346165	0.1228298	0.8258988	0.4065449	0.8592552	0.5436294	0.250038	0.09322574
Score	0	0.9950735	0.8329876	0.0766184	0.6918141	0.7134974	0.7688952	0.1926998	0.2303760	0.6465977	0.791465	0.90170226

Marginal effect:

See marginal1

Exercise 6 Second Model

Q1:

Propose a model specification. Write the Likelihood function.

See function named "likelihood2"

Q2:

Estimate parameters and compute the marginal effect of the proposed model

Parameters:

	301,Science	210,Science	501,Science	101,Science	301,arts	301,economics	203,Science	101,arts	301,others	100,Science	701,Science	501,economics
Intercept	0.0000000	0.8800453	0.05980625	0.2576430	0.1769324	0.6540201	0.1010576	0.3588601	0.7569390	0.4650446	0.03405881	0.2818704
Quality	0.7372435	0.7372435	0.73724346	0.7372435	0.7372435	0.7372435	0.7372435	0.7372435	0.7372435	0.7372435	0.73724346	0.7372435

Marginal effect:

See marginal2

Exercise 7 Counterfactual simulations

Q1:

Example and justify, which model (first or second model) you think is appropriate to conduct this exercise.

I think the second model, conditional logit model is appropriate. The reason is that conditional logit model uses alternative variant regressor "quality", which means the value of "quality" changes when choice changes. However, the first model, multinomial logit model uses alternative invariant regressor "score", whose value changes only when the observed student changes.

Q2:

Calculate choice probabilities under the appropriate model.

See the model "res3"

Q3：

Simulate how these choice probabilities change when these choices are excluded.

See the matrix "pr" in "logit_c_3"