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Econ613

HW1

March 1,2021

PART1

1. Exercise 1.

1.1. Number of students is: 340823.

1.2. Number of schools: 6165.

1.3. Number of programs: 32.

1.4. Number of choices: 3080.

1.5. Missing test score: 179887.

1.6. Apply to the same school: 174.

1.7. Apply to less than 6 choices: 21001.

2. Exercise 2.

	jssdistrict	schoolcode	program	sssdistrict	ssslong	ssslat	cutoff	quality	size
	<chr>	<int>	<chr>	<chr>	<dbl>	<dbl>	<int>	<dbl>	<int>
1	Agona Swedru	30403	General Arts	Abura/Asebu/Kwamankese (Ab~	-1.20	5.13	208	244.	63
2	Kwahu South (Mpraeso)	21001	General Science	Kwahu South (Mpraeso)	-0.636	6.62	252	297.	449
3	Fanteakwa (Begoro)	9021002	Motor Vehicle Mec~	Kwahu South (Mpraeso)	-0.636	6.62	204	247.	56
4	Akatsi	70503	Business	Keta	0.853	5.91	205	245.	255
5	East Akim (Kibi)	21303	Business	East Akim (Kibi)	-0.454	6.18	312	343.	462
6	Abura/Asebu/Kwamankese (Abu~	30402	Business	Abura/Asebu/Kwamankese (Ab~	-1.20	5.13	192	250.	530
7	Ga East (Abokobi)	20301	General Science	Akwapim South (Nsawam)	-0.268	5.83	385	407.	450
8	Ho Municipal	70114	General Arts	Ho Municipal	0.526	6.72	217	254.	21
9	Cape Coast Municipal	30109	Business	Cape Coast Municipal	-1.31	5.15	261	298.	242
10	Accra Metropolitan	10121	Visual Arts	Accra Metropolitan	-0.197	5.61	335	382.	500
11	Tema	10112	Visual Arts	Accra Metropolitan	-0.197	5.61	316	376.	300
12	Accra Metropolitan	10106	General Arts	Accra Metropolitan	-0.197	5.61	293	340.	395
13	Accra Metropolitan	9010101	Mech. Eng. Craft ~	Accra Metropolitan	-0.197	5.61	223	292.	93
14	Kumasi Metro	61202	Home Economics	Asutifi (Kenyasi)	-2.52	7.03	224	276.	450
15	Birim South (Akim Oda)	20604	Agriculture	Birim South (Akim Oda)	-0.969	5.86	208	253.	225
16	Accra Metropolitan	10110	Home Economics	Accra Metropolitan	-0.197	5.61	343	408.	535
17	Ejisu/Juaben (Ejisu)	51606	Agriculture	Ejisu/Juaben (Ejisu)	-1.39	6.71	207	249.	162
18	Dangme East (Ada)	10301	General Arts	Dangme East (Ada)	0.107	5.91	271	306.	293
19	Dangme East (Ada)	10302	Business	Dangme East (Ada)	0.107	5.91	236	285.	310
20	Dangme East (Ada)	9010301	Accounting	Ga West (Amasaman)	-0.398	5.66	205	251.	144

3. Exercise 3.

X represents individuals.

	X	schoolchoice	schoolcode	distance
	<int>	<chr>	<int>	<dbl>
1	1	1	50112	8.81
2	1	2	50107	8.81
3	1	3	50202	18.9
4	1	4	50202	18.9
5	1	5	50702	17.2
6	1	6	50901	63.9
7	2	1	70102	0
8	2	2	70602	21.7
9	2	3	70107	0
10	2	4	70105	0
11	2	5	70605	21.7
12	2	6	70603	21.7
13	3	1	50702	0
14	3	2	50705	0
15	3	3	50115	9.44
16	3	4	50706	0
17	3	5	51603	12.5
18	3	6	50703	0
19	4	1	90501	0
20	4	2	90403	25.7

4. Exercise 4.

For each ranked choice:

	schoolchoice	cutoff_mean	cutoff_sd	quality_mean	quality_sd	distance_mean	distance_sd
	<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1	1	291.	54.6	335.	46.4	34.1	47.7
2	2	275.	48.9	319.	42.1	32.9	45.8
3	3	263.	45.9	308.	39.7	30.7	43.8
4	4	252.	43.5	297.	38.1	26.5	41.6
5	5	234.	29.0	281.	23.2	30.3	28.4
6	6	230.	28.0	277.	23.1	30.9	28.4

By student test score quantile:

	G	cutoff_mean	cutoff_sd	quality_mean	quality_sd	distance_mean	distance_sd
	<fct>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1	(158,252]	238.	37.4	284.	33.7	28.2	38.9
2	(252,283]	248.	41.1	294.	35.6	29.9	41.0
3	(283,323]	261.	45.4	306.	38.3	31.5	41.2
4	(323,469]	286.	53.4	330.	45.0	34.1	40.0

PART 2

5. Exercise 5.

ϵ is represented by *e*.

	y	ydum	x1	x2	x3	e
1	0.9625656	1	1.575155	3.559389	0	1.77582959
2	4.6270623	1	2.576610	3.695663	0	4.36122695
3	-4.9362401	0	1.817954	10.780100	0	2.08430532
4	-3.3207540	0	2.766035	8.316954	0	0.34526302
5	0.5168815	1	2.880935	6.115934	0	2.06410042
6	-2.1562662	0	1.091113	6.982409	0	2.31856618
7	-0.8411111	0	2.056211	5.664632	0	1.28960489
8	2.1935290	1	2.784838	3.686255	0	1.66935234
9	-4.4476302	0	2.102870	9.210705	0	0.81856034
10	1.8659774	1	1.913229	4.180697	0	2.83272945
11	0.5446019	1	2.913667	7.075456	0	2.91611200
12	0.1300452	1	1.906668	4.662065	0	1.53790192
13	2.9444939	1	2.355141	3.373279	1	2.55427585
14	3.4492829	1	2.145267	2.323585	0	2.46618916
15	-0.6974400	0	1.205849	5.316899	1	2.04074978
16	3.3324330	1	2.799650	4.359413	0	3.39632485
17	1.6200883	1	1.492175	2.597565	0	1.66728601
18	-0.1611703	1	1.084119	3.960450	0	1.60229183
19	0.6853590	1	1.655841	2.074180	0	0.06511117
20	4.0602933	1	2.909007	1.771134	0	1.66350546

6. Exercise 6.

6.1.

Correlation between Y and X1 is 0.41348. It is 0.78652 lesser than 1.2. It is significant different.

6.2 and 6.3.

	[,1]
intercept	2.4907098
x1	1.1976226
x2	-0.8970514
x3	0.0875850

6.4.

Standard errors:

```
  intercept          x1          x2          x3
0.040620200 0.017358550 0.002876599 0.021694530
```

7. Exercise 7.

7.1.

Probit:

```
> probit
$par
[1]  3.04275799  1.17235964 -0.90546589 -0.01124976

$value
[1] 2213.313

$counts
function gradient
      65       16

$convergence
[1] 0

$message
NULL
```

The estimated coefficients (intercept, x1, x2, x3):

```
 3.04275799  1.17235964 -0.90546589 -0.01124976
```

If x1 increases, the probability of Y is greater than mean(Y) is higher.

If x2 or x3 increases, the probability of Y is greater than mean(Y) is lower.

Logit:

```
> logit
$par
[1]  5.42655537  2.10059552 -1.61851052 -0.01963215

$value
[1] 2223.017

$counts
function gradient
      65       16

$convergence
[1] 0

$message
NULL
```

The estimated coefficients (intercept, x1, x2, x3):

```
5.42655537  2.10059552 -1.61851052 -0.01963215
```

If x1 increases, the probability of Y is greater than mean(Y) is higher.

If x2 or x3 increases, the probability of Y is greater than mean(Y) is lower.

Linear probability:

```
> beta
                  [,1]
intercept  0.885823611
x1         0.146193985
x2        -0.102832042
x3        -0.008053057
```

Sd:

```
> beta_se
  intercept          x1          x2          x3
0.040620200 0.017358550 0.002876599 0.021694530
```

If x1 increases by 1 unit, the probability of Y is greater than mean(Y) increase by 0.146

If x2 increases by 1 unit, the probability of Y is greater than mean(Y) decrease by 0.102

If x3 increases by 1 unit, the probability of Y is greater than mean(Y) decrease by 0.008

They are significant.

The direction of them are the same. We can not compare their magnitude.

8. Exercise 8.

Probit marginal effect:

```
> probit.me.mean
(Intercept)          x1          x2          x3
 0.37324175  0.14380827 -0.11106954 -0.00137997
```

Probit marginal effect standard error:

```
     probit_ME_mean probit_ME_sd
[1,]    0.373156433  0.009940289
[2,]    0.143952461  0.004854838
[3,]   -0.111139963  0.001277500
[4,]   -0.001197355  0.005837196
```

logit marginal effect:

```
> logit.me.mean
 (Intercept)           x1           x2           x3
 0.372080184  0.144030901 -0.110975755 -0.001345977
```

logit marginal effect standard error:

```
> logit_est
     logit_ME_mean logit_ME_sd
[1,]   0.380929156 0.011366178
[2,]   0.147931423 0.005381553
[3,]  -0.113792063 0.002003597
[4,]  -0.001270638 0.005769196
```