

Problem Set 3 Solutions
14.75J 2003

Note: The average score among the problem sets that were turned in on time is 75, and the range was 56 to 86.

1. a) The project studied in this paper is the Maternal Child Health-Family Planning (MCH-FP) project. It began in 1978, although the data covered in the paper only covers 1983-1993. It was an intervention in rural Bangladesh where all households in the intervention area were visited by a Community Health Worker (CHW) once every two weeks. CHWs were young local married women, and they offered free contraceptives to the households they visited.

b) The authors hypothesize that many processes in development, including the demographic transition, are social processes. Specifically, they hypothesize that your probability of using contraception is heavily influenced by the prevalence of contraceptive use in your social network. Further, they determine that in the area studied social networks are almost perfectly segregated by religion—Hindus interact only with Hindus, Muslims with Muslims. Thus, if the social network hypothesis is correct, a woman’s likelihood of using contraception should be affected by the prevalence of use in her own religious group but unaffected by the prevalence in the other religious group. The quote from the paper says that this was true in the data. Most other explanations for the trend in contraception use do not predict this sharp divide between religions, so the result provides strong support for their hypothesis.

c) I won’t type up the algebraic manipulation, almost all of you did fine with that. What most of you did not do was verify that $l-g$ was in fact positive so that you can divide through by it without changing the direction of the inequality. This is not trivial, but can be derived from the assumptions in the paper.

Problem 2

```
-----  
-  
    log: H:\14.75J\pbset3.log  
    log type: text  
    opened on: 20 Oct 2003, 09:50:19  
  
. .  
. clear  
  
. set mem 500m  
  
Current memory allocation  
  
          current          memory usage  
settable      value      description      (1M = 1024k)  
-----
```

```

set maxvar          5000    max. variables allowed          1.733M
set memory          500M    max. data space                  500.000M
set matsize         400     max. RHS vars in models          1.254M
-----
                                         502.987M

```

```
. set more 1
```

```
.
. use "H:\14.75J\MATLAB2.DTA", clear
.
```

a) The graphs below show that the rate of contraception use increases by year and by age. This is expected, because the intervention would at first convince only a few women to use contraceptives, but as the project continued more women will be convinced and the social norm will gradually change. They also show that women are more likely to use contraception as they get older until their late 30s and the rate is flat from late 30s on. The upward trend probably exists for two major reasons. First, very young women are likely to want to have children and as they age the likelihood increases that they have had as many children as they want to have. Second, older women have simply had more time to interact with each other so they are more likely to have had interactions with other women that convince them it is okay to use contraception, especially when the first effect is taken into account. It flattens out in the late 30s because by that time fertility decreases enough that women who for some reason have not yet been convinced yet are unlikely to change their minds.

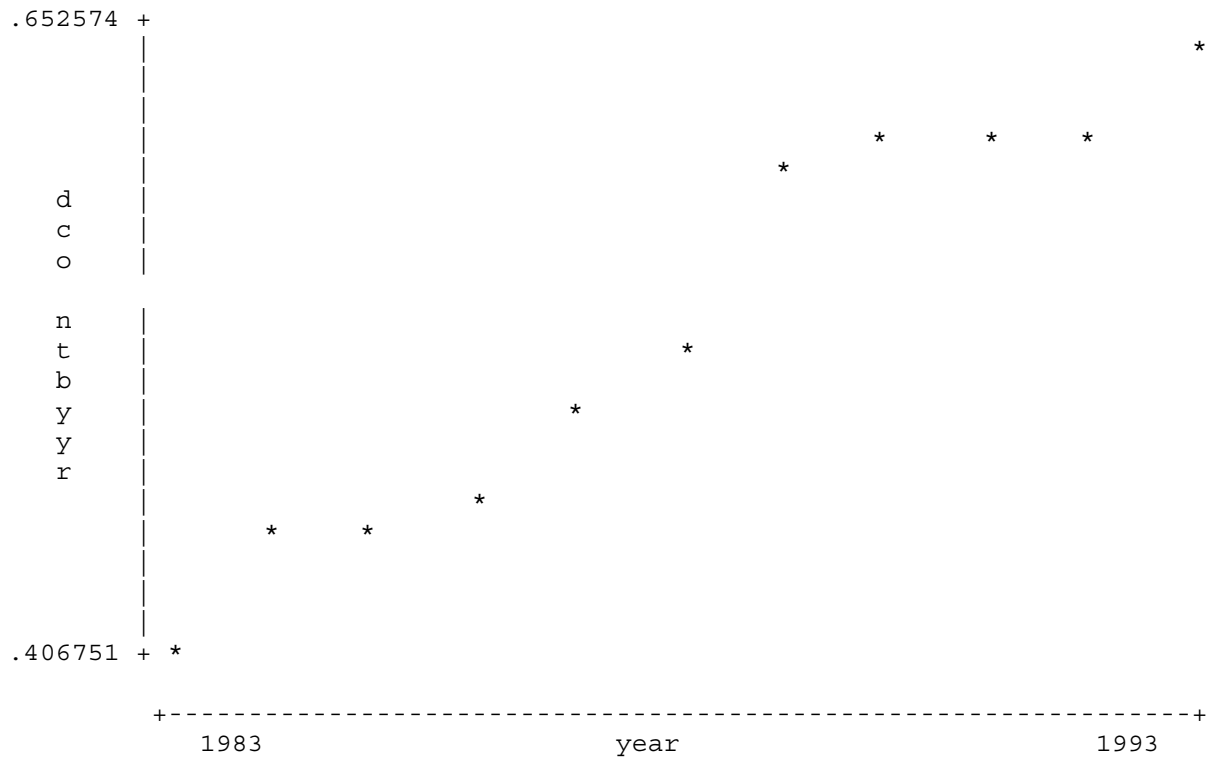
```
. summ dcont
```

Variable	Obs	Mean	Std. Dev.	Min	Max
dcont	141177	.5499763	.4974979	0	1

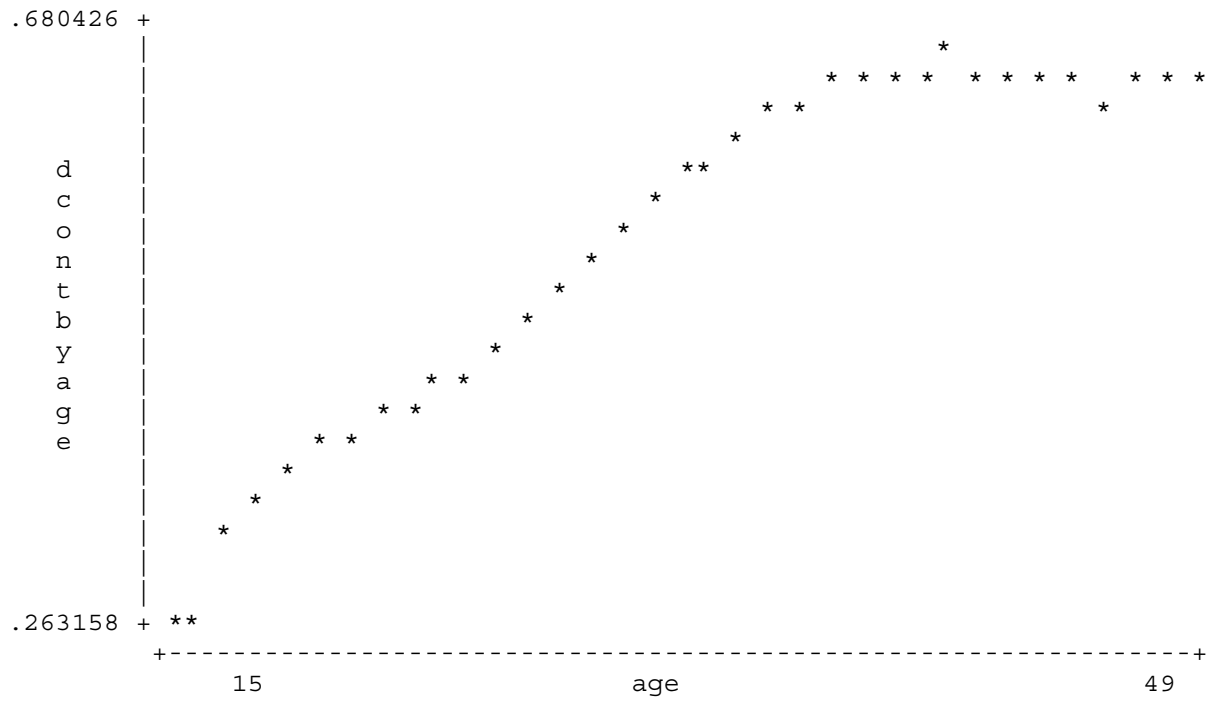
```
.
. bysort year: egen dcontbyyr = mean (dcont)
```

```
. bysort age: egen dcontbyage = mean (dcont)
.
```

```
. plot dcontbyyr year
```



```
. plot dcontbyage age
```



b) The correlation between dcont and lscnt is 0.1744, which is fairly large considering all of the other things that are likely to affect whether or not a woman uses contraception. Lscntu30 is the

rate of contraception use among the women in the village who are under 30, and this value might have an affect on the women who are over 30 as well. That is why I merge the value of lscontu30 back into the whole dataset, so I can find the correlation between dcont and lscontu30 for women who are over 30 as well. I find the correlation between lscontu30 and dcont is slightly larger for women under 30 than women who are over 30, and that the correlation between lscontu30 and dcont is slightly larger for women over 30 than women who are under 30. This supports the statement that “while both young and old women put more weight on their own group, cross-group effects are substantial and statistically significant” (p.43). We also find that the correlations are generally slightly stronger for older women than for younger women.

```

.
. corr dcont lscont
(obs=121136)

-----+-----
          |      dcont      lscont
-----+-----
      dcont |      1.0000
      lscont |      0.1744      1.0000

.

. sort vill year

. save "H:\14.75J\data1.DTA", replace
file H:\14.75J\data1.DTA saved

.

. keep if age < 30
(72967 observations deleted)

. sort vill year

. by vill year: egen lscontu30 = mean (ldcont)
(6446 missing values generated)

. save "H:\14.75J\data2.DTA", replace
file H:\14.75J\data2.DTA saved

. use "H:\14.75J\data1.DTA", clear

. merge vill year using "H:\14.75J\data2.DTA"

. drop _merge

.

. keep if age > 30
(74371 observations deleted)

. sort vill year

. by vill year: egen lscontu30 = mean (ldcont)
(4924 missing values generated)

. save "H:\14.75J\data2.DTA", replace
file H:\14.75J\data2.DTA saved

```

```
. use "H:\14.75J\data1.DTA", clear
. merge vill year using "H:\14.75J\data2.DTA"
```

```
. corr dcont lscont if age < 30
(obs=54298)
```

	dcont	lscont
dcont	1.0000	
lscont	0.1609	1.0000

```
. corr dcont lscont if age > 30
(obs=61128)
```

	dcont	lscont
dcont	1.0000	
lscont	0.1778	1.0000

```
. corr dcont lscontu30 if age < 30
(obs=61764)
```

	dcont	lsco~u30
dcont	1.0000	
lscontu30	0.1660	1.0000

```
. corr dcont lscontu30 if age > 30
(obs=61882)
```

	dcont	lsco~u30
dcont	1.0000	
lscontu30	0.1388	1.0000

```
. corr dcont lscontu30 if age < 30
(obs=61764)
```

	dcont	lsco~o30
dcont	1.0000	
lscontu30	0.1342	1.0000

```
. corr dcont lscontu30 if age > 30
(obs=61882)
```

	dcont	lsco~o30

```

dcont | 1.0000
lscont030 | 0.1895 1.0000

```

c) There are two factors to pay attention to when comparing importance: significance and magnitude. Almost all of the variables are strongly significant, because they have t-statistics which are well over 2. The only exceptions are child and some of the year dummies.

This means that to compare their relative importance, we have to look at the values of the coefficients. Lscont clearly has the largest coefficient and it is strongly significant, so it is important. Age is also very important, however. Although the coefficient on age is much smaller, you have to take into account that while lscont can only vary between 0 and 1, age varies between 15 and 49, and every year increase causes a 2.7% increase in the likelihood of using contraception. This effect is tempered by the negative coefficient on age squared, but still quite large. All of the other variables are much less important.

```

. reg dcont lscont age agesq child childsq sons sonsq mort year2 year3 year4
yea
> r5 year6 year7 year8 year9 year10

```

Source	SS	df	MS	Number of obs =	121136
Model	1800.44308	17	105.908416	F(17,121118) =	462.58
Residual	27730.0327121118		.228950549	Prob > F =	0.0000
				R-squared =	0.0610
				Adj R-squared =	0.0608
Total	29530.4757121135		.243781531	Root MSE =	.47849

dcont	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
lscont	.7932081	.0202639	39.14	0.000	.7534911 .832925
age	.0270384	.0017348	15.59	0.000	.0236382 .0304386
agesq	-.0002203	.0000263	-8.39	0.000	-.0002717 -.0001688
child	.0010836	.0025069	0.43	0.666	-.0038299 .0059971
childsq	-.0022323	.000338	-6.60	0.000	-.0028948 -.0015697
sons	.0425619	.0029142	14.60	0.000	.0368501 .0482737
sonsq	-.0075737	.0006498	-11.66	0.000	-.0088473 -.0063
mort	-.000206	.0000692	-2.98	0.003	-.0003417 -.0000704
year2	.0413072	.007374	5.60	0.000	.0268543 .0557602
year3	-.0230221	.0067581	-3.41	0.001	-.0362679 -.0097764
year4	-.0121577	.0067773	-1.79	0.073	-.025441 .0011256
year5	.0174081	.0067235	2.59	0.010	.0042302 .030586
year6	.0009086	.0062671	0.14	0.885	-.0113749 .013192
year7	.0355627	.0062608	5.68	0.000	.0232915 .0478338
year8	.0082027	.0058746	1.40	0.163	-.0033114 .0197168
year9	-.0147932	.0057677	-2.56	0.010	-.0260978 -.0034887
year10	-.0129662	.0057131	-2.27	0.023	-.0241637 -.0017687
_cons	-.4715913	.0293422	-16.07	0.000	-.5291016 -.414081

```
. log close
  log: H:\14.75J\pbset3.log
  log type: text
  closed on: 20 Oct 2003, 09:50:47
-----
```

Part 3

Problem 5.

- a) See pages 300-301. This is false, developing countries generally have higher death rates than developed countries, because they have worse nutrition, health care, etc. However, it is important to note that while the age-specific death rates are likely to be much higher, the overall death rate may not be much higher. This is because the population of a developing country is likely to be younger, on average, and younger people have lower death rates.
- b) See pages 302-304. It is clear from table 9.3 that this is true—Europe and North America together contain 19.3% of world population in 1750 and 30.0% in 1900, so they must have been growing faster than the rest of the world over this period. This is because Europe and North America were experiencing immigration, and also because they were in phase 2 of the demographic transition, when death rates had fallen but birth rates remained high.
- c) See pages 298-300. This is not necessarily true, because population growth rate is given by birth rate minus death rate so countries A and B could have the same fertility rates, but country A would still have a lower population growth rate if it has a higher death rate. For instance, country A could be in phase 1 of the demographic transition with high birth and death rates and country B could be in phase 2 with birth rates that remain high but death rates that have fallen
- d) This is certainly true, it is the case in phase 2 of the demographic transition which is a consistent part of the development process. Also, there are many factors affecting both birth and death rates so we cannot expect them to move together perfectly anyway.
- e) See page 314. This change in the timing essentially has the potential to switch families from the hoarding approach to the targeting approach. In the hoarding approach results in higher fertility because couples will want to have enough children to take care of them in their old age, and since they are not sure exactly how many will survive the lucky couples will end up with more surviving children than they needed. Targeting prevents this.

Problem 16

- a) They will have a child if the marginal benefit is greater than the marginal cost. So based on the table below, they will have 2 children, because the marginal benefit of the third is less than the marginal cost.
- b) Here, marginal benefit is less than marginal cost for the first three children, equal to marginal cost for the fourth, and less than marginal cost for all children above four. The family will thus be indifferent between three and four children.

Number of Children	Marginal benefit	Marginal cost, part a	Marginal cost, part b
One	500	100	50
Two	250	100	50
Three	90	100	50
Four	50	100	50
Five	40	100	50
Six	20	100	50
Seven	10	100	50
Eight	0	100	50

- c) See pages 321-323. The cost to the couple of having children is less because other family members help care for the children. The key is that the slope of the line representing the cost to the couple is less than the slope of the line representing the cost to the family as a whole. This means the social costs are greater than the private costs, so there is an externality, since the decision-makers are not taking the full cost of their decision into account. The number of children that is privately optimal for the couple is thus greater than the number of children that is socially optimal for the family as a whole.