Problem Set 1

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1 Problem 1. OLS in MATA

1.1 Part 1

Results with myreg1

```
. myreg1 lnwage hieduc exp exp2
b[4,1]
            c1
r1   .08264541
r2   .02523881
r3  -.00037668
r4   1.3094414
symmetric V[4,4]
            c1          c2          c3          c4
r1   1.195e-06
r2   1.595e-07   .00001683
r3  -4.035e-09  -3.770e-07   8.579e-09
r4  -.00001749  -.00017676   3.899e-06   .00211062
```

Results with Stata OlS command

```
. quiet reg lnwage hieduc exp exp2
. matrix list e(b)
e(b)[1,4]
        hieduc         exp        exp2       _cons
y1   .08264541   .02523881  -.00037668   1.3094414
. matrix list e(V)
symmetric e(V)[4,4]
            hieduc         exp        exp2       _cons
hieduc   1.195e-06
   exp   1.595e-07   .00001683
  exp2  -4.035e-09  -3.770e-07   8.580e-09
 _cons   -.0000175  -.00017676   3.899e-06   .00211066
```

1.2 Part 2

Results with myreg2

```
.
. myreg2 lnwage hieduc exp exp2
b[4,1]
             c1
r1   .08264541
r2   .02523881
r3  -.00037668
r4   1.3094414
symmetric V[4,4]
             c1          c2          c3          c4
r1   1.520e-06
r2   1.712e-07   .00001632
r3  -4.045e-09  -3.685e-07   8.451e-09
r4  -.00002216  -.00016979   3.771e-06   .00208194
. quiet reg lnwage hieduc exp exp2, robust
```

Results with Stata's OLS and robust standard errors

```
.
. matrix list e(b)
e(b)[1,4]
        hieduc         exp        exp2       _cons
y1   .08264541   .02523881  -.00037668   1.3094414
. matrix list e(V)
symmetric e(V)[4,4]
             hieduc         exp        exp2       _cons
hieduc   1.520e-06
   exp   1.712e-07   .00001632
  exp2  -4.045e-09  -3.685e-07   8.451e-09
 _cons  -.00002216  -.00016979   3.771e-06   .00208194
.
```

2 Problem 2. Poisson using Maximum Likelihood

If y_i is distributed Poission with mean $exp(X_i'\beta)$, hence the likelihood function for a sample of N observations is given by:

$$L(\beta) = \prod_{i=1}^{N} \frac{1}{y_i!} exp((X^{'}\beta)y_i)exp(-exp(X^{'}\beta))$$

And taking logs we get:

$$lnL(\beta) = \sum_{i}^{N} [-exp(X^{'}\beta) + y_i exp(X^{'}\beta) - ln(y_i!)]$$

Which is the form we use for pur maximum-likelihood estimation

```
. hist(num_awards), title("Number of Awards") color("orange")
(bin=14, start=0, width=.42857143)
```

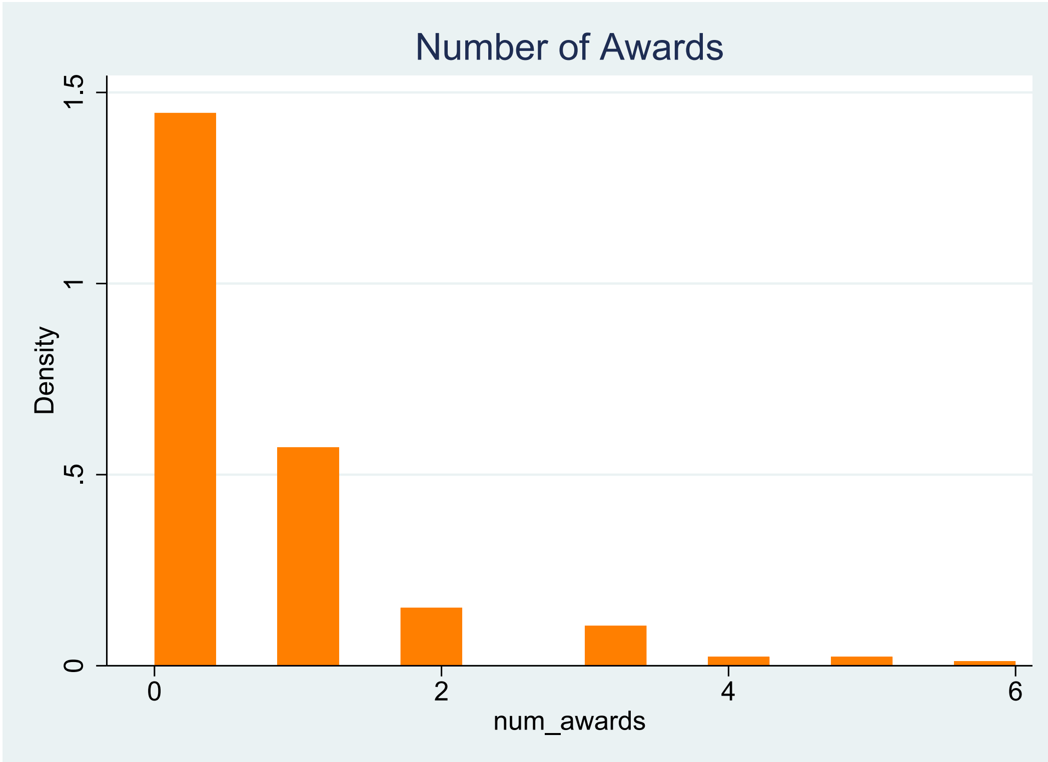

Table 1: Number of Awards

	Mean	Variance
Number of awards	0.63	1.11

3 Problem 3. Mean Squared Error simulation - Sample Size and Distribution

4 Problem 4. Small number of clusters - Wild Bootstrap

Table 2: Poisson Estimation

	(1) Stata Poisson	(2) mypois
main		
general	0.0000	0.0000
	(.)	(.)
academic	1.0839**	1.0839**
	(0.3583)	(0.3583)
vocation	0.3698	0.3698
	(0.4411)	(0.4411)
math score	0.0702***	0.0702***
	(0.0106)	(0.0106)
Constant	-5.2471***	-5.2471***
	(0.6585)	(0.6585)
Observations	200	200

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Average of the squared error (MSE): OLS and Poisson

	0.01 OLS	0.01 POIS	0.1 OLS	0.1 POIS	1 OLS	1 POIS
N=50	.1299549	.0042042	.1333647	.0056097	.1320351	.0055389
N=1000	.1288181	.0000436	.1201455	.0001288	.1294419	.0001041

Table 4: Coefficient of treatment significant? Frecuency

	Cluster	Bootstrap
lnemp	10	0
lnemp2	10	1

Table 5: Coefficient of treatment insignificant? Frecuency

	Cluster	Bootstrap
lnemp	0	10
lnemp2	0	9

Table 6: Coefficient of treatment significant? Frecuency (few clusters)

	Cluster	Bootstrap
lnemp	97	3
lnemp2	97	0

Table 7: Coefficient of treatment insignificant? Frecuency (few clusters)

	Cluster	Bootstrap
lnemp	0	94
lnemp2	0	97